

DRAFT

REVISED REMEDIAL ACTION PRE-FINAL DESIGN (90 PERCENT) REPORT VOLUME II OF III

GENERAL HEALTH AND SAFETY PLAN
CONSTRUCTION QUALITY ASSURANCE PLAN

ENVIRO-CHEM SUPERFUND SITE
ZIONSVILLE, INDIANA

PREPARED FOR
ENVIRONMENTAL CONSERVATION AND
CHEMICAL CORPORATION TRUST

PREPARED BY
DOW ENVIRONMENTAL, INC.
PITTSBURGH, PENNSYLVANIA

DEI PROJECT NUMBER 2455.006

OCTOBER 1995



Dow Environmental

APPENDIX C
GENERAL HEALTH AND SAFETY PLAN

DRAFT

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REVISED REMEDIAL ACTION

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NOTICE

"This document is a portion of the overall design package and, therefore, cannot be referenced, in whole or in part, as a standalone document for any other purpose.

TABLE OF CONTENTS

<u>SECTION</u>		<u>PAGE</u>
1.0	INTRODUCTION	1-1
1.1	Background	1-1
1.2	Scope of Activities	1-4
2.0	CONTRACTOR ORGANIZATION AND RESPONSIBILITIES	2-1
2.1	General	2-1
2.2	Overall Management Responsibilities	2-1
2.2.1	Project Manager	2-2
2.2.2	Site Manager	2-2
2.2.3	Health and Safety Officer	2-3
2.2.4	Site Safety Officer	2-4
3.0	MEDICAL MONITORING	3-1
3.1	Medical Surveillance Requirements	3-1
4.0	EMPLOYEE, SUPERVISOR, AND VISITOR TRAINING	4-1
4.1	Site-Specific Training	4-1
4.2	Daily Safety "Tailgate" Meeting	4-3
5.0	HAZARD ASSESSMENT	5-1
5.1	Chemical Hazards	5-1
5.2	General Physical Hazards	5-2
5.2.1	Slipping and Tripping Hazards	5-2
5.2.2	Contact with Energized Sources	5-2
5.2.3	Electrical Work	5-4
5.2.4	Noise	5-7
5.2.5	Manual Lifting	5-7
5.2.6	Weather-Related Hazards	5-8
5.2.7	Heat/Cold Stress	5-8
5.2.8	Welding, Cutting, and Hot Work	5-11
5.2.9	Excavation and Trenching	5-13
5.2.10	Drilling	5-15
5.2.11	Heavy Equipment and Motor Vehicle Operation	5-16
5.2.12	Flammable and Combustible Liquids	5-18
5.3	Biological Hazards	5-19
5.4	Radiological Hazards	5-19

TABLE OF CONTENTS (CONTINUED)

<u>SECTION</u>		<u>PAGE</u>
6.0	SITE CONTROL MEASURE	6-1
6.1	Work Zones	6-1
6.2	Markings/Signs	6-2
6.3	Communications	6-2
6.4	Security	6-3
7.0	PERSONAL PROTECTIVE EQUIPMENT	7-1
7.1	General	7-1
7.2	General Levels of Protection	7-1
7.2.1	Respiratory Protection	7-2
7.2.2	Summary of PPE Required per Task	7-3
8.0	AIR MONITORING/SAMPLING REQUIREMENTS	8-1
8.1	Perimeter	8-1
8.2	Industrial Hygiene Sampling	8-1
8.3	Real-Time Ambient Air Monitoring	8-2
9.0	DECONTAMINATION PROCEDURES	9-1
9.1	Equipment Decontamination	9-1
9.1.1	Decontamination Pad	9-1
9.1.2	Small Equipment Decontamination	9-2
9.1.3	Large Equipment Decontamination	9-2
9.2	Personnel Decontamination	9-3
9.2.1	Personnel	9-3
9.2.2	Equipment	9-3
9.3	Community Public Health Preservation	9-7
10.0	STANDARD OPERATING PROCEDURES	10-1
10.1	General	10-1
10.2	Confined Space	10-4
10.3	Underground Storage Tanks (UST)	10-4
10.4	Underground Utilities	10-4
10.5	Illumination	10-4
10.6	Sanitation	10-5
10.6.1	Potable Water	10-5
10.6.2	Non-Potable Water	10-5
10.6.3	Toilet Facilities	10-6
10.6.4	Food Handling	10-6
10.6.5	Showers	10-6

TABLE OF CONTENTS (CONTINUED)

<u>SECTION</u>		<u>PAGE</u>
11.0	EMERGENCY RESPONSE PLAN	11-1
11.1	Pre-Emergency Planning	11-1
11.2	Anticipated Types of Emergencies	11-1
11.3	Lines of Authority, Personnel Roles, and Communication	11-2
11.4	Training	11-3
11.5	Emergency Recognition and Prevention	11-3
11.6	Safe Distances and Places of Refuge	11-3
11.7	Site Security and Control	11-3
11.8	Evacuation Routes and Procedures	11-4
11.9	Decontamination	11-4
11.10	Emergency Medical Treatment and First Aid	11-4
11.10.1	Emergency Physician Access	11-4
11.11	Emergency Alerting Procedures	11-6
11.12	Response Procedures (Priorities and Responses)	11-6
11.12.1	First Priority	11-6
11.12.2	Second Priority	11-6
11.12.3	Third Priority	11-6
11.12.4	Fourth Priority	11-8
11.13	Small Fires	11-8
11.14	Large Fires	11-8
11.15	First-Aid Procedures	11-9
11.15.1	Physical Injury	11-9
11.15.2	Chemical Injury	11-9
11.16	Emergency PPE and Equipment	11-10
11.17	Emergency Response Drills and Critiques	11-10
12.0	SPILL RESPONSE, CONTROL, AND CLEANUP	12-1
12.1	Spill Control Equipment	12-1
12.2	Training	12-1
12.3	Onsite Spill Response Procedures	12-1
12.4	Response to Offsite Spills	12-3
13.0	ONSITE REFERENCE/DOCUMENTATION RECORDKEEPING AND REPORTING	13-1
13.1	Required References	13-1
13.2	Required Documentation	13-2
13.3	Daily Information	13-3
13.4	Training Logs	13-4
13.5	Accident/Incident Reports	13-4

FIGURES

<u>NUMBER</u>		<u>PAGE</u>
1-1	Site Location Map	1-2
1-2	Site Map	1-3
5-1	Activity Hazard Analysis	5-3
9-1	Decontamination Procedures Level B Protection	9-4
9-2	Decontamination Procedures Level C Protection	9-5
9-3	Decontamination Procedures Level D Protection	9-6
11-1	Hospital Route	11-5

TABLES

<u>NUMBER</u>		<u>PAGE</u>
7-1	Personal Protective Equipment	7-4
8-1	Monitoring Instrument Action Levels Unless Otherwise Directed	8-4
11-1	Emergency Response Numbers	11-7

ACRONYMS

Personnel

HSO	Health and Safety Officer
SSO	Site Safety Officer
PM	Project Manager
SM	Site Manager
TL	Team Leader
MC	Medical Consultant

Equipment

PID	Photoionization Detector
LEL/O ₂	Lower Explosive Limit/Oxygen

Areas

SZ	Support Zone
CRZ	Contamination Reduction Zone
EZ	Exclusion Zone

Manuals

HSP	Health and Safety Plan
AMP	Air Monitoring Plan
SDCP	Spill Discharge and Control Plan

Other

ABIH	American Board of Industrial Hygiene
ACGIH	American Conference of Governmental Industrial Hygienists
ARC	American Red Cross
CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
MSDS	Material Safety Data Sheets
NIOSH	National Institute of Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PPM	Parts Per Million
USCG	United States Coast Guard
U.S. EPA	United States Environmental Protection Agency

1.0 INTRODUCTION

1.1 Background

This Health and Safety Plan (HSP) has been developed for the remedial action activities to be conducted at the Environmental Conservation and Chemical Corporation (ECC) Site, located in Zionsville, Indiana. The HSP contains the procedures that are necessary to protect onsite personnel and the general public during this phase of work.

The ECC Site is located in Boone County, approximately 10 miles northwest of Indianapolis, on State Route 421 in Zionsville, Indiana (Figure 1-1). The Site occupies 6.5 acres to the west of the Northside Sanitary Landfill (NSL), a closed solid waste disposal facility. The ECC Site is also bounded on the south and east by NSL property. An unnamed ditch separates the two facilities along the eastern boundary. Several residential homes are located within 1/2 mile of the facility to the north and west (Figure 1-2).

In 1977, ECC began operations at the Site that consisted of the recovery, reclamation, and brokering of primary solvents, oils, and other wastes. Waste products were received in drums and bulk tankers and prepared for subsequent reclamation or disposal. Processes to reclaim solvents and oil included distillation, evaporation, and fractionation.

The U.S. Environmental Protection Agency (U.S. EPA) investigations concerning the accumulation of contaminated storm water onsite, improper drum inventory, and several spill incidents lead to civil law suits, and finally the placement of ECC into receivership in July 1981.

Drum shipments to the Site were halted in February 1982. Surface cleanup activities conducted by U.S. EPA contractors during 1983 and 1984 included the removal of cooling pond waters, waste drums, tank wastes, contaminated soil, and cooling pond sludge.

A Remedial Investigation/Feasibility Study (RI/FS) was conducted by CH2M Hill for the U.S. EPA from 1983 through 1986. The Record of Decision (ROD) for the Site was issued on September 25, 1987 and amended on June 7, 1991, and the Consent Decree for remediation of the Site was entered on September 10, 1991.



ENVIRO-CHEM SITE

SITE LOCATION MAP

ENVIRO-CHEM SUPERFUND SITE

ZIONSVILLE, IN

CIENT: ENVIRONMENTAL CONSERVATION & CHEMICAL CORP. TRUST

JOB NUMBER 2455-002

SCALE: AS SHOWN

FIGURE
NUMBER

1-1

REV
9

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1.2 Scope of Activities

A detailed scope of work for this project is outlined in the project specifications and final design documents. A summary of the activities is presented below.

Soil vapor extraction (SVE) will be employed over the northern and central areas of the site. The southern area of the site, which includes a concrete pad, aggregate subbase, and subsurface soils will be excavated to approximately 9 feet and placed on the northern portion of the site for SVE treatment. The concrete pad will be crushed into pieces with a maximum dimension of 3 inches prior to placement on the northern portion of the site. A low permeability barrier will then be installed between the central and southern areas of the site to minimize migration of subsurface water and/or vapor from the central area to the southern areas. The excavation at the southern area of the site will then be backfilled with native soils. The northern and central site areas will be capped with a RCRA Subtitle C cover. The southern concrete pad area soils will be remediated by performing the following activities:

- Pressure grout the existing 20-foot by 20-foot by 12 feet deep sump (i.e., the ECC sump) located in the concrete pad area. The ground interval will be from the floor of the excavation to the bottom of the sump.
- Crush the concrete pad into pieces with a maximum diameter of 3 inches, and place the crushed concrete along with the aggregate subbase in a segregated treatment zone in the northern end of the site. The concrete pads and subbase aggregate at the former process building and at the former entrance road to the facility shall also be removed, crushed, and combined with the crushed southern concrete pad for SVE treatment.
- Water collected in the sump and the excavation shall be pumped to temporary storage facilities and will either be disposed of offsite or treated onsite and discharged to surface water in accordance with applicable Federal, state and local regulations.
- Excavate the subsoils beneath the southern concrete pad area.
- Perform exit soil sampling in the excavation (by U.S. EPA).

- Install low permeability barrier and drainage layer between the excavation and SVE treatment area.
- Backfill the excavated area with native soils.
- Place a 12-inch layer of topsoil on the backfill soils in the excavated area and seed with appropriate vegetation. Capping of the excavation area will be based on the results of exit soil sampling in the excavation.
- SVE construction.
- SVE operation and maintenance.

2.0 CONTRACTOR ORGANIZATION AND RESPONSIBILITIES

2.1 General

Health and safety is a line management responsibility. The Contractor's Project Manager (PM) is responsible for the overall direction, implementation, and enforcement of health and safety for the project. Daily implementation and enforcement of the HSP during field activities will be directed by the Contractor's Site Manager (SM). The SM will be technically assisted in this function by the Contractor's SSO. The SSO's main function is to serve as a technical advisor to line management in matters regarding health and safety. The SSO will primarily be responsible for the technical and administrative functions relative to health and safety necessary during onsite activities. Additionally, although health and safety is a staff function, the SSO has the authority to stop work if an "imminently dangerous" situation exists. Such a situation will be immediately reviewed by the PM and SM, and the Contractor's Certified Industrial Hygienist (CIH). From a technical standpoint, the SSO will report to the CIH who will serve as the HSO for this project.

All other personnel working on the Site will report to the SM and ultimately the PM and, in keeping with OSHA requirements and management principles, are required to comply with all procedures outlined in this HSP. The Contractor shall prepare an organization chart and clearly outline the roles and responsibilities for safety and health.

2.2 Overall Management Responsibilities

The responsibilities of the Contractor's Project Manager, Site Manager, Health and Safety Officer, and the Site Safety Officer are as follows.

2.2.1 Project Manager

The Project Manager (PM) is the overall manager of the project. The PM has the following responsibilities:

- To see that the project is performed in a manner consistent with the Contractor's Corporate Health and Safety Program.
- To have a Health and Safety Plan prepared and approved.
- To provide the Project Health and Safety Officer with project information related to health and safety matters and development of the HSP.
- To implement the HSP.
- To monitor compliance with the HSP by respective company and subcontractor personnel.

The PM has the authority to take the following actions:

- To determine personnel assignments on this project.
- To temporarily suspend field activities, if the health and safety of personnel are endangered, pending further consideration by the Health and Safety Officer.

2.2.2 Site Manager

The Site Manager (SM) is the appointed manager of the project on the Site. The SM is responsible for the general oversight of the progress of onsite activities, including the management of all onsite field personnel, and for implementing actions to ensure compliance with the HSP.

The SM is responsible for:

- Coordinating and providing the necessary labor and materials for the implementation of the HSP.
- Actively supporting jobsite safety by including safety as a part of pre-job planning and scheduling.
- Evaluating job specifications for potential safety and health hazards and review with the safety representatives.
- Communicating jobsite safety and health control measures among contractors and employees.
- Actively supporting and participating in the implementation of the Safety Program pertaining to company employees.

2.2.3 Health and Safety Officer

The Health and Safety Officer (HSO) is responsible for the preparation of the HSP. The HSO is also responsible for assisting the PM in implementing and enforcing the HSP. Specific responsibilities include:

- Conducting the initial site-specific health and safety orientation meeting and providing support for additional meetings as periodically required.
- Providing support for all onsite health and safety activities as needed and shall be responsible for decision-making involving the upgrade or downgrade in personal protective equipment.
- Establishing new health and safety measures as appropriate based on changing conditions.

- Maintaining all related health and safety documentation, including, but not limited to, employee medical qualifications, respirator fit tests, medical surveillance, and field monitoring results.
- Authority to stop work if conditions are deemed unsafe.
- Authority to temporarily remove an individual from the Site if he/she is not complying with the HSP protocols.

2.2.4 Site Safety Officer

The Site Safety Officer (SSO) is responsible for providing technical guidance to the Site Manager on matters pertaining to health and safety. The SSO's primary responsibility is to assist the SM in the implementation and enforcement of the HSP.

Specific duties of the SSO include, but are not limited to:

- Monitoring compliance with the HSP.
- Coordinating and conducting onsite safety briefings for all site personnel.
- Managing health and safety equipment (respirators, instruments, boots, gloves, suits, etc.).
- Coordinating and performing air monitoring with the HSO as specified in the HSP.
- Establishing work/rest regimen in conjunction with the Site Manager (i.e., heat stress/cold stress monitoring).
- Helping establish emergency response provisions with local authorities (e.g., hospital, fire, and police).
- Continuously monitoring health and safety conditions during the implementation of the site work.

- Maintaining site safety field logs to record air monitoring results, weather conditions, employees onsite, safety problems, and other related information.
- Reporting all incidents to the HSO.
- Stopping work if conditions are deemed unsafe; also to temporarily remove an individual from the Site if he/she is not complying with the HSP. In both cases, the SSO will confer with the HSO and SM regarding the followup actions; the presence of an SSO will not abrogate safety responsibilities of other personnel.
- Daily safety inspections of work areas.

3.0 MEDICAL MONITORING

3.1 Medical Surveillance Requirements

Prior to performing any work in a project exclusion zone or contamination reduction zone, all site personnel must successfully complete an entry medical examination or demonstrate that they currently participate in a regular medical monitoring program which satisfies project-specific guidelines and the OSHA requirements of 29 CFR 1910.120(f).

All personnel hired specifically for the project who will work in the exclusion or contamination reduction zones at this Site who are not included in a medical monitoring program that meets the requirements of 29 CFR 1910.120 must receive entry and exit examinations and 12-month interval examinations during work at the Site. Any personnel who participate in an existing medical surveillance program will continue in their program for the duration of site work.

The minimum acceptable medical examinations for this project include:

- Past Medical History - On entry to the program, information concerning past occupational and personal as well as family history of disease
- Present Medical Profile - All pertinent medical information regarding present state of health and during each year of field work in hazardous material projects
- Exposure History - Information concerning the cumulative duration of time spent on potentially hazardous sites, the primary toxic substances, and the levels of protection employed by each Site
- Laboratory Analyses - Hematology, liver and kidney function tests, and urinalysis
- Physical Examination
- Hearing Test

- Vision Test
- Pulmonary Function Test

Optional tests, if recommended by the examining physician include:

- Electrocardiogram
- Chest X-ray
- Special Tests - Medical information concerning the effects of exposure to specific contaminants

The Contractor must include a letter, signed by the Contractor's medical consultant, that they have reviewed the project documents and have approved the specific medical tests to be conducted.

Medical clearance forms stating that the individual is cleared for hazardous waste work, in accordance with 29 CFR 1910.120, and respiratory protection, in accordance with 29 CFR 1910.134, shall be kept on site for all employees working in an exclusion or contamination reduction zone.

4.0 EMPLOYEE, SUPERVISOR, AND VISITOR TRAINING

All personnel must meet health and safety training regulations outlined in 29 CFR 1910.120(e). This will primarily involve exclusion zone and contamination reduction zone workers; hence 40-hour introductory, refresher, and supervisory training requirements for supervisory personnel will apply. There may be site visitors who fall under OSHA's 24-hour training provisions, and any decision regarding applicability of these provisions will be made by the Contractor HSO.

To comply with OSHA's site-specific training requirements, the HSO will conduct a training session immediately preceding field activities. This training will be attended by applicable personnel and will address HSP elements, integrated with any other applicable requirements. Any need for additional site-specific training due to changes in the work force will be conducted by the SSO. The SSO will also be responsible for safety training for onsite personnel and "visitor" briefings.

4.1 Site-Specific Training

The minimum content of the site-specific training program, which will include instructions concerning potential hazards, is outlined below:

- Introduction to the hazardous materials previously identified at the Site
 - Definition of hazardous materials
 - Classification of hazardous materials
 - Potential for ignitability, corrosivity, reactivity, and/or toxicity
 - Possible radiological hazards
- Toxicological impacts of possible contaminants
 - Expected exposure levels
 - Routes of probable exposure
 - Respiratory tract
 - Dermal penetration
 - Ingestion

- Expected toxic effects
- ACGIH threshold limit levels
- Carcinogens

- Emergency planning and principles to be used on the job site
 - Emergency medical care and treatment
 - General safety practices
 - Emergency telephone numbers
 - Onsite communications
 - Names and responsibilities of key project safety personnel

- Respiratory protection level used onsite
 - General principles
 - Potential hazards
 - Protective measures provided by air monitoring
 - Response (evacuation) requirements activated by abnormally high volatile organics in ambient air

- Protective clothing requirements
 - Level of protection
 - Articles of protective clothing
 - Purpose of each article of protective clothing
 - Proper use of protective clothing

- Decontamination
 - Concern regarding proper decontamination
 - Extent of decontamination required
 - Personnel decontamination under normal conditions
 - Personnel decontamination during medical emergencies
 - Decontamination of equipment
 - Disposal of contaminated materials

Personnel will be required to sign a document at the conclusion of the training program stating that they understand and will abide by the provisions found in this HSP.

4.2 Daily Safety "Tailgate" Meeting

Each day prior to the start of work activities, all site personnel will meet and sign an attendance sheet. At this time, the SSO will indicate the work scheduled for the day and what level of protection will be required. Also, any need for changes in safety procedures will be addressed. The crews will be asked to discuss any concerns they have regarding health and safety.

All topics covered in the meeting will be documented and posted for the day in the safety office.

5.0 HAZARD ASSESSMENT

5.1 Chemical Hazards

Previous site investigations have indicated the presence of various volatile and semi-volatile organic compounds (VOCs and SVOCs) and metals in the soil and groundwater at the ECC site. These compounds were detected during either the Remedial Investigation (CH2M Hill, 1986) or Supplemental Investigations (Dow Environmental Inc., 1993 and 1995). Based on this data a Health Risk Assessment was conducted by DEI which identified the following contaminants of concern:

Volatiles

1,1,1-Trichloroethane
1,1,-Dichloroethane
1,1,2-Trichloroethane
Chloroform
1,1-Dichloroethene
trans-1,2-Dichloroethene
Ethylbenzene
Methylene chloride
Tetrachloroethene
Toluene
Trichloroethene
Acetone
2-Butanone
2-Hexanone
4-Methy-2-pentanone
Xylenes (Total)

Semivolatiles

Phenol
Isophorone
Naphthalene
bis(2-ethylhexyl)phthalate
di-n-butyl phthalate
Diethyl phthalate
Dimethyl phthalate
Butyl benzyl phthalate

*Add
add'l comps.*

The Contractor will be responsible for evaluating the existing information on the site contaminants and preparing a hazard assessment based on activities to be conducted. This assessment must be consistent with the requirements of 29 CFR 1910.120(c).

5.2 General Physical Hazards

The Contractor will be required by this HSP to develop an activity hazard analysis which will indicate the hazards associated with all phases of work activities onsite. Figure 5-1 illustrates an example of a format that can be used for this analysis. The following types of general hazards are anticipated during project execution. Any additional hazards identified by the Contractor shall be described in the Contractor's HSP.

5.2.1 Slipping and Tripping Hazards

As with any construction-type project, uneven work surfaces and other slip or trip hazards may be present. Proper site housekeeping and removal of trash and debris will reduce slipping and tripping hazards.

5.2.2 Contact With Energized Sources

During any site activities which involve work around live utilities, a potential exists for personnel, heavy equipment, or motor vehicles to come in contact with energized sources. Additionally, personnel could come in contact with energized parts of machinery or power tools. Contact with energized sources may result in fire, explosion, and/or electrocution. All work performed near electrical sources must be performed consistent with the OSHA electrical safety requirements found in 29 CFR 1926.400 through 1926.449.

Control efforts for this hazard include requirements that all machinery and power tools used onsite be properly maintained, positioned, guarded, and operated by competent personnel. Equipment will not be permitted within a 20-foot radius of energized sources with nominal voltage less than 300 kV. For energy systems with nominal voltage greater than 300 kV, the distance required will be in accordance with OSHA regulations. The possibility of the presence of underground pipelines, electric wires, conduits, or vessels containing material under pressure will be investigated prior to the start of any subsurface work. Underground utility clearance will be obtained in conjunction with local authorities. The potential for contact with overhead utilities will be carefully assessed. Utility clearance will be documented in the SSO or SM logbook.

5.2.3 Electrical Work

Site work involving electrical installation or energized equipment must be performed by a qualified licensed electrician. All electrical work will be performed in accordance with NEC 70 and OSHA electrical safety requirements found in 29 CFR 1926.400 through 1926.449. Workers are not permitted to work near electrical power circuits unless the worker is protected against electric shock by de-energizing and grounding the circuit followed by affixing appropriate lock-out/tag-out devices, or by guarding or barricading the circuit and providing proper personal protective equipment. All electrical installations must comply with the requirements of the NEC. All electrical wiring and equipment used must be UL listed, or listed by a nationally recognized testing laboratory.

All electrical circuits and equipment must be grounded in accordance with the NEC and NESC regulations. The path to ground from circuits, equipment, and enclosures will be permanent and continuous. Ground fault circuit interrupters (GFCIs) are required on all 120-volt, single phase, 15- and 20-amp outlets on sites that are not part of the permanent wiring of a building or structure. A GFCI is required when using an extension cord. GFCIs must be tested regularly with a GFCI tester.

Heavy duty extension cords will be used; flat-type extension cords are not allowed. All extension cords must be the three-wire type, and designed for hard/extra hard usage. Electrical wire or cords passing through work areas must be protected from water and damage. Worn, frayed, or damaged cords and cables will not be used. Walkways and work spaces will be kept clear of cords and cables to prevent a tripping hazard. Extension cords and cables may not be secured with staples, hung from nails, or otherwise temporarily secured. Cords or cables passing through holes in covers, outlet boxes, etc. will be protected by bushings or fittings.

All switch boxes, circuit breakers, fuse cabinets, etc. must be marked to indicate their purpose. Warning signs will be posted wherever energized electrical power circuits are exposed or concealed from view.

In existing installations, changes in the circuit protection (in order to increase the load in excess of the load rating of the circuit wiring) are not allowed. All circuits will be protected against an overload.

Switches, circuit-breakers, fuse panels, and motor controllers must be contained in appropriately rated and listed enclosures, and installed so that water cannot enter or accumulate in wire ways or other electrical parts. Workers will be instructed in the safe procedures when working with energized equipment. Plugs and receptacles will be kept out of water (unless they are approved for submersion).

All lamps used in temporary lighting will be protected from accidental contact and breakage. Metal shell and paper-lined lamp holders are not permitted. Fixtures, lamp holders, lamps, receptacles, etc. are not permitted to have live parts.

Before a worker sets up, services, or repairs a system where unexpected energizing (or release of stored energy) could occur and cause injury or electrocution, the circuits energizing the parts must be locked-out and tagged. Only authorized personnel will perform lock-out/tag-out procedures. All workers affected by the lock-out/tag-out will be notified prior to, and upon completion of, the lock-out/tag-out procedure.

Training on lock-out/tag-out procedures will be provided to all involved workers. Training will include information on the recognition of hazardous energy sources, the purpose and use of energy control procedures, proper lock-out/tag-out procedures, and prohibitions against re-starting or re-energizing a system which has been locked-out and tagged-out. Training will be documented by the SSO.

Lock-out/tag-out devices must be capable of withstanding the environment to which they are exposed. Locks will be attached in such a way as to prevent other personnel from operating the equipment, circuit, or control, or from removing the lock unless they resort to excessive force. Tags will identify the worker who attached the device, and contain information which warns against the hazardous condition that will result from the system's unauthorized start-up. Tags must be legible and understood by all affected workers and incidental personnel.

The procedures for attaching and removing lock-out/tag-out devices include the following steps:

1. Disconnect the circuits and/or equipment to be worked on from all electrical energy sources. Ensure that the system is completely isolated so that it cannot be operated at that shut-off point or at any other location.
2. Release stored electrical energy.
3. Block or relieve stored non-electrical energy.
4. Place a lock on each shut-off or disconnect point necessary to isolate all potential energy sources. Place the lock in such a manner that it will maintain the shut-off/disconnect in the off position.
5. Place a tag on each shut-off or disconnect point. The tag must contain a statement prohibiting the unauthorized re-start or re-connect of the energy source and the removal of the tag, and the identity of the individual performing the tag and lock-out.
6. Each worker who will be working on the system must place their own lock and tag on each lock-out point.
7. A qualified person must verify the system cannot be re-started or re-connected, and de-energization of the system has been accomplished.
8. A qualified person will conduct an inspection of the work area, to verify that all tools, jumpers, shorts, grounds, etc. have been removed so that the system can then be safely re-energized.
9. All workers stand clear of the system.

10. Each lock and tag will be removed by the worker who attached it. If the worker has left the site, then the lock and tag may be removed by a qualified person under the following circumstances:
 - a. The qualified person ensures the worker who placed the lock and tag has left the site.
 - b. The qualified person ensures the worker is aware the lock and tag has been removed before the worker resumes work onsite.

5.2.4 Noise

Noise is a potential hazard associated with the operation of heavy equipment, power tools, pumps, or generators. High noise operations will be evaluated by the SSO. Employees with an exposure exceeding 85 dBA (a scale, slow response) will be required to wear hearing protection. As a general practice, hearing protection will be worn when operating heavy equipment and power tools. If employees are exposed above 85dBA, the Contractor shall develop a hearing conservation program.

5.2.5 Manual Lifting

Back injuries are among the leading occupational injuries reported by industrial workers. Back injuries such as pulls and disc impairments can be reduced by using proper manual lifting techniques. Leg muscles are stronger than back muscles, so workers should lift with their legs and not with their back. Proper manual lifting techniques include the following steps:

- Plan the lift before lifting the load. Take into consideration the weight, size, and shape of the load. Preview the intended path of travel and the destination to ensure there are no tripping hazards along the path.
- Hands and fingers should be protected from rough edges, sharp corners, and metal straps by using heavy work gloves. Also, keep hands away from potential pinch points between the load and other objects.

- If the load is too heavy, then do not lift it alone. Lifting is always easier when performed with another person. Assistance should always be used when it is available.
- Keep your back straight and do not bend your back too far - instead bend at your knees.
- Feel the weight; test it.
- When you begin to lift, do so smoothly, and let your legs do the lifting. If you must pivot, do not swing just the load; instead, move your feet and body with the load.

5.2.6 Weather-Related Hazards

Weather-related hazards include the potential for heat or cold stress, electrical storms, treacherous weather-related working conditions, or limited visibility. These hazards correlate with the season in which site activities occur. Outside work will be suspended during electrical storms. In the event of other adverse weather conditions, the SSO will determine if work can continue without endangering the health and safety of site personnel.

5.2.7 Heat/Cold Stress

Heat stress is a significant potential hazard during the warmer months. Heat stress manifests itself as one of three conditions: heat cramps, heat exhaustion, or heat stroke. Heat cramps are brought about by a prolonged exposure to heat. As an individual sweats, water and salts are lost by the body, triggering painful muscle cramps. The signs and symptoms of heat cramps include:

- Severe muscle cramps, usually in the legs and abdomen.
- Exhaustion, often to the point of collapse.
- Dizziness or periods of faintness.

First aid treatment includes shade, rest, and fluid replacement. If available, the individual should drink electrolyte-replacement fluids (e.g., Gatorade, Squincher, 10-K). If the individual has not recovered within 1/2 hour, then transport to the hospital for medical attention.

Heat exhaustion usually occurs in a healthy individual who has been exposed to excessive heat while working or exercising. Blood collects near the skin in an effort to rid the body of excess heat. The signs and symptoms of heat exhaustion include:

- Rapid and shallow breathing.
- Weak pulse.
- Cold and clammy skin, with heavy perspiration.
- Skin appears pale.
- Fatigue, weakness, and/or dizziness.
- Elevated body temperature.

First aid treatment includes cooling the victim, elevating the feet, and replacing fluids. If the individual has not recovered within 1/2 hour, then transport to the hospital for medical attention.

Heat stroke occurs when an individual is exposed to excessive heat and their body systems become overwhelmed by heat and begin to stop functioning. This condition is a medical emergency, requiring the immediate cooling of the victim and transport to the hospital immediately.

The signs and symptoms of heat stroke include:

- Victim has stopped sweating.
- Dry, hot, red skin.
- Body temperature approaching or above 105°F.
- Dilated (large) pupils.
- Loss of consciousness; victim may lapse into a coma.

Local weather conditions may produce an environment which will require restricted work schedules in order to protect employees. The SSO will be observing workers for any potential symptoms of heat stress. Adaptation of work schedules and training on recognition of heat stress conditions should help prevent heat-related illnesses from occurring.

Cold stress is a danger at low temperatures and when the wind chill factor is low. Cold stress is generally described as a local cooling (frost nip, frost bite, and freezing) or a general cooling (hypothermia). Personnel working outdoors in temperatures at or below freezing may be subject

to local cooling. Areas of the body that have a high surface area-to-volume ratio, such as fingers, toes, and ears, are the most susceptible. The three categories of local cooling include:

- Frost nip - characterized by a blanching or whitening of the skin.
- Frost bite - skin has a waxy or white appearance and is firm to the touch, but the tissue beneath is resilient.
- Freezing - skin tissue is cold, pale, and solid.

Frost nip and frost bite first aid includes covering the affected area with warmth and retreating to a warm area. Frozen tissue is a medical emergency and the victim must be transported to the hospital immediately.

General cooling (hypothermia) occurs when exposure to cold reduces body temperature. With prolonged exposure, the body becomes unable to maintain its proper internal temperature. Without treatment, hypothermia will lead to stupor, collapse, and death.

The signs and symptoms of mild hypothermia include:

- Shivering
- Numbness
- Drowsiness

First aid for mild hypothermia includes using heat to raise the individual's body temperature. Heat may be applied to the victim in the form of heat packs, hot water bottles, and blankets. The signs and symptoms of severe hypothermia include:

- Unconsciousness
- Slowed respiration or respiratory arrest
- Slowed pulse or cardiac arrest
- Irrational or stuporous state
- Muscular rigidity

First aid for severe hypothermia includes handling the victim very gently; rough handling may set off an irregular heart beat. Do not attempt to re-warm the severely hypothermic victim;

re-warming may cause the development of an irregular heart beat. Severe hypothermia is a medical emergency, and the victim must be transported to the hospital immediately.

Prevention of cold stress is a function of whole body protection. Adequate insulated clothing will be worn when the air temperature drops below 40°F. Reduced work periods may be necessary in extreme conditions to allow adequate periods in a warm area.

5.2.8 Welding, Cutting, and Hot Work

Hot work will be performed in accordance with 29 CFR 1926.350 through 1926.354. Hot work includes oxygen-acetylene welding and cutting, arc welding and cutting, gas metal welding, propane torches, and grinding.

A Hot Work Permit must be completed by the SSO prior to the start of the task. The SSO will conduct a safety briefing on hot work rules and procedures, and all hot work participants will sign the permit. The permit will be posted at the location of the hot work. The SSO will also conduct a visual inspection of the area for flammable and combustible materials before hot work begins. Hot work will not be performed if there is a possibility of an explosive atmosphere or an oxygen-enriched atmosphere. If combustible material is found in the area, then the hot work crew must either move the intended hot work away from the combustible material, move the combustible material away from the intended hot work, or shield the combustible material from the hot work. The SSO will designate a fire watch to monitor the hot work. The fire watcher will have access to a properly rated fire extinguisher and will remain on-duty for 1/2 hour after the hot work is complete.

All hot work equipment will be inspected daily, prior to use. If the equipment is found to be defective, it will be removed from service and tagged with a "Do Not Use" sign. Hoses and connections will be rated for the operating requirements of the system and will be tested regularly. Damaged or worn hoses, torches, and connections, etc. will not be used. All welding and cutting personnel will be trained in the safe operation of their equipment.

Hot work personnel and nearby workers will be shielded from welding rays, flashes, sparks, molten metal, and slag. When performing hot work on items that have a toxic coating (i.e., lead-, chromium-, nickel-based paint), workers must use proper respiratory protection and a

respiratory protection program will be implemented. Other hot work PPE may include: a welding helmet, cutting goggles, leather gauntlet gloves, and a long-sleeved leather jacket.

Cable, hoses, and other hot work equipment will be kept out of passageways, aisles, and stairways. Workers will be able to easily distinguish between the fuel gas hose and the oxygen hose. Slightly damaged cables can be repaired as long as the repair is not within 10 feet of the welding machine. Cable will be unrolled before hot work begins.

Oxygen cylinders, manifolds, and regulators must be completely free from oil, grease, and other flammable substances. Interchanging regulators, manifolds, and hoses with any other compressed gas is prohibited. Manifolds, hoses, and regulators will be stored in ventilated boxes. All compressed gas valves will be opened slowly. Torch valves will be closed and the gas supply will be turned off when hot work is suspended. When not in use, the cylinder manifold and header hose connections will be capped. Compressed gas cylinder valves will be closed and valve caps will be put on when they are in storage, in transit, or empty. Valve protection caps will be put on when the regulator is taken off. Before the regulator is removed, the compressed gas cylinder valve will always be closed and the gas released from the regulator.

Compressed gas cylinders will be stored outside in a well-ventilated location. Empty cylinders will be segregated from full ones, and oxygen cylinders will be stored at least 20 feet away from fuel gas cylinders. All compressed gas cylinders will be stored at least 40 feet away from flammable and combustible material. Smoking is prohibited where compressed gas cylinders are stored, handled, or used. Fuel gases must be kept away from open flames, hot metal, electrodes, electrical circuits, and any other sources of heat. Cylinders will be stored in an upright position and secured. They will not be intentionally dropped, struck, or permitted to strike each other hard. Cylinder valve protection caps will not be used for lifting cylinders from one position to another. Compressed gas cylinders are not permitted to be taken into confined spaces. No one except the gas supplier will refill gas cylinders or mix different gases in a cylinder.

Hot work torches will only be lit by friction lighters. Workers are not permitted to use or carry matches or lighters while performing hot work due to the danger of hot work sparks or molten metal "splattering" onto the matches or lighter and causing a fire or explosion. Manifolds are required to have the name of the substance written on it (at least 1 inch in height). All manifolded systems will contain back-flash arresters. Acetylene regulators will not be adjusted

greater than 15 psi (for easier shut off in a fire emergency). No items will be put on top of the cylinder manifold when it is in use which will damage the manifold or interfere with its quick closing of the valves.

Hot work performed on this project is not expected to include arc welding or gas metal welding. Refer to the OSHA welding standards if these additional types of welding become necessary.

5.2.9 Excavation and Trenching

All excavations will be performed in accordance with 29 CFR 1926 Subpart P. Excavations are defined to include trenching. Prior to starting any excavation, the possibility of the presence of underground pipelines, electric wires, conduits, or vessels containing material under pressure will be investigated. Underground utility clearance will be obtained in conjunction with authorities from local utilities. Utility clearance will be documented in the SSO or Site Manager's logbook. All surface encumbrances that will create a hazard to workers will be removed or supported.

Excavations, adjacent areas, and protective systems will be inspected by a competent person on the following schedule:

- Daily, prior to work in or around the excavation beginning
- After every rain storm or other hazard-increasing occurrence
- As needed throughout the work shift as conditions change

If the inspector notes a hazardous condition, all endangered workers must be immediately removed from the hazard, and all work in the excavation stopped until the necessary corrections have been made.

The following safety controls will be implemented for all excavation activities:

- Excavations that may contain toxic or oxygen-deficient atmospheres will be monitored by the SSO prior to the start of each shift and at periodic intervals during the shift. Results of air monitoring will be documented in the SSO's logbook. Additional safeguards may be necessary when excavating areas that

may contain a hazardous atmosphere. Refer to the OSHA excavation standards if a hazardous atmosphere is suspected.

- The sides of all excavations in which workers may be exposed to danger from shifting soil will be guarded by a protective system. Appendices B and C of 29 CFR 1926 Subpart P provide information on proper sloping, shoring, and benching protective systems. Excavations less than 5 feet, which do not have a potential for a cave-in, do not require a protective system.
- If the stability of adjacent structures is endangered by the excavation, then support systems such as shoring, bracing, or underpinning will be provided.
- Personnel will not work in excavations in which there is accumulated water, or water is accumulating, unless adequate precautions have been taken to protect workers against the hazards caused by water accumulation.
- Workers will be protected from loose rock or soil which could fall from an excavation face.
- Excavated soil will be placed at least 2 feet from the edge of the excavation.
- Workers in areas exposed to public vehicular traffic will wear orange traffic warning vests.
- When mobile equipment is operated near an excavation, or required to approach the edge of an excavation, a warning system (e.g., barricades, hand signals, mechanical signals, stop logs) will be used.
- A stairway, ladder, ramp, or other safe means of exit will be located in trench excavations that are greater than 4 feet in depth. The means of exit will require no more than 25 feet of lateral travel for each person in the excavation.
- Workers are not permitted underneath loads handled by lifting or excavating equipment.

5.2.10 Drilling

All drilling will be performed in accordance with 29 CFR 1926 and applicable local regulations.

The following safety controls will be implemented during monitoring well installation activities:

- Drill rigs will be equipped with an operational emergency stop device. Drillers and helpers must be aware of the location of the device. The device must be tested prior to initial drilling, and periodically thereafter.
- The drill must never leave the controls while tools are rotating unless all personnel are prevented from working near the rig and the driller remains in close visual contact with the rig.
- A long-handled shovel or equivalent must be used to clear drill cuttings away from the boring and rotating tools. Hands and/or feet are not to be used for this purpose.
- If personnel must work near any tools which could rotate, the driller must shut down the rig prior to initiating such work.
- Only equipment which has been approved by the manufacturer may be used in conjunction with sections of drilling tools. Pins that protrude from augers will not be allowed.
- Drillers, helpers, samplers, etc. must secure all loose clothing when working in the vicinity of drilling operations.
- No personnel shall climb the drill mast unless fall prevention measures have been installed.
- Never place hands or fingers under the bottom of an auger while it is being positioned. Always use the tool hoist to lift and position augers.

- Inspect cathead and rope for integrity prior to initial drilling operations. The cathead and rope should be clean, dry, and unworn. Use as few wraps as needed. Minimize the length of rope being used. Never wrap the rope around hands, arms, or legs. Personnel should stand clear while materials are being hoisted as the cathead could grab the rope and cause the material to rise quickly to the top of the mast, causing the rope to break and the material to fall.

5.2.11 Heavy Equipment and Motor Vehicle Operation

Heavy equipment and motor vehicles will only be operated by qualified and licensed personnel. Equipment will not be operated in a manner that will endanger persons or property. All heavy equipment and motor vehicles will be operated in accordance with the manufacturer's instructions and 29CFR 1926 Subpart O. The following controls will also be implemented during this project:

- Equipment and vehicles will be inspected by the operator on a daily basis, prior to starting work. Records of tests and inspections will be maintained onsite by the contractor.
- Any unsafe equipment or vehicles will be removed from service until safety defects can be corrected. Defective equipment will be tagged with a "Do Not Operate" sign.
- Equipment will be shut down and locked out before maintenance or repairs are made.
- Operators will be trained and experienced in the use of their equipment.
- Equipment will be properly guarded.
- Signals will be given to the operators of both equipment and vehicles in any work area by one designated person.

- All personnel will stay clear of the operational area of the equipment. Workers are not permitted to stand directly underneath any load or piece of equipment, i.e., manlift, backhoe bucket, crane load, etc.
- Operators will not leave their equipment unattended while it is running.
- All equipment and vehicles will have an audible backup alarm and an audible warning device (i.e., a horn).
- Vehicles or equipment will not be operated in a careless or unsafe manner.
- Each vehicle and piece of equipment will have a portable fire extinguisher rated not less than 10-B:C.
- Personnel will wear appropriate PPE when working with heavy equipment. Dermal protection must fit properly and be taped to prevent "caught on" or "caught between" hazards.
- Seat belts will be worn when operating moving equipment.
- Motor vehicles and heavy equipment will be shut down during refueling operations.
- Work areas will be adequately illuminated.
- Whenever equipment is parked, the parking brake will be set. If the equipment is parked on an incline, in addition to setting the parking brake, the wheels will also be chocked.
- Workers are prohibited from riding in equipment buckets and booms.
- Whenever equipment is in use near excavation the machine will be positioned no closer than necessary to the excavation and the location will be assessed to ensure there is no danger of cave-in.

5.2.12 Flammable and Combustible Liquids

Storage of flammable/combustible liquids will not exceed 1,100 gallons in any one area. All flammable and combustible liquids will be stored outdoors, in a well-ventilated area, and away from excessive heat or direct sunlight. These liquids will not be stored in areas used for exits, stairways, or aisles. Material which reacts with water will not be stored near flammable or combustible liquids. All sources of ignition are prohibited in this area, including: smoking, cutting and welding, hot surfaces, open flames, sparks (static, electrical, and mechanical), and frictional heat. "Flammable Liquids" and "No Smoking or Open Flames" signs will be posted in the storage area. At least one portable fire extinguisher rated not less than 20-B:C will be located within 10 feet from the entrance to the storage area, and at least one similar fire extinguisher will be located between 25 and 75 feet outside the storage area.

Each fueling area will have at least one portable fire extinguisher rated not less than 20-B:C within 75 feet of each pump and dispenser. Smoking and open flames are prohibited in fueling areas. Motors will be turned off before equipment is refueled. At least one portable fire extinguisher rated 20-B:C will be located on all vehicles transporting or dispensing flammable or combustible liquids.

Flammable and combustible liquids should only be handled in areas that have adequate ventilation. Workers are not permitted to use liquids having a flash point less than 100°F as a cleaning/degreasing fluid. Workers should change as soon as possible if flammable or combustible liquid is spilled on their clothing.

Dispensing areas (for transfer of more than 5 gallons) will be separated from other work areas by at least 25 feet. Spills in this area will be controlled by using drainage, diking, or absorbent material. Flammable liquids will only be transferred when the two containers are electrically interconnected (i.e., bonded). When dispensing flammable and combustible liquids into smaller portable containers, only approved safety containers equipped with back-flash arresters will be used.

Handling, storage, and use of flammable and combustible liquids will be in compliance with 29 CFR 1926.152 and all applicable sections of the NFPA National Fire Code.

5.3 Biological Hazards

Numerous types of pest organisms may be present depending on the time of year, including mosquitos, snakes, and ticks. Field personnel are encouraged to use insect repellents when mosquitos and ticks are present. To avoid snake bites, personnel will check the ground for snakes before walking through grassy or debris strewn areas. A first-aid kit and insect repellent will be available for use in the field. In many parts of the United States, tick-borne diseases pose a significant health risk during warm months. Personnel are advised to check themselves periodically throughout the day, and thoroughly as they shower at the end of the day. Report any snake or tick bites to the SSO.

Poison ivy may also be evident in the general work area. All personnel should be made aware of what the rash-producing plant looks like so as to avoid any contact either on skin or clothing. If contact is made on the skin, wash the area immediately with soap and water. If irritation persists, contact the SSO.

5.4 Radiological Hazards

Reports indicate during the early 1970s that 20,000 pounds of waste was shipped to the ECC Site from facilities under control of the Department of Energy which may have contained low level radiation not exceeding 0.001 millicuries. It is expected, however, that all of the waste was removed during the initial Phase I emergency cleanup, and that no remains exist onsite. During a site investigation of surface debris in November 1992 by AWD, no indications of radiation were detected. For this reason, no encounters with radioactive material are expected during site preparation and material removal activities.

6.0 SITE CONTROL MEASURE

6.1 Work Zones

The exclusion zones (EZ) will be designated as all areas within the remedial boundary as shown on Contract Drawing G-2. The contractor will be required to establish either physical barriers and/or administrative controls to regulate the entrance and exit of personnel and equipment from this area. These controls shall be detailed in the Contractor's HSP.

Contamination reduction zones (CRZs) shall be established at each exit from the exclusion zone. These zones shall be designed to accommodate either personnel and/or equipment exiting the EZ, depending on their use. The main CRZ shall be the existing concrete decontamination pad as shown on Drawing G-2, Support Zone Plan (attached). This CRZ shall be the primary location for the decontamination of heavy equipment and vehicles which have entered the EZ.

The Support Zone shall be defined as all areas within the support zone security fence that are not within a CRZ or EZ. No personnel or equipment will be permitted to enter the support zone from the EZ without going through the appropriate decontamination. All site trailers (i.e. office, shower, storage) shall be located in the support zone. Placement of site trailers shall be determined by the Contractor and illustrated in the contractor's HSP.

During remedial activities the Contractor shall ensure that any areas designated as a support zone remain free of potential contamination (i.e. no potential exposure to workers and/or the public via soil, water, or air emissions from the EZ). If a designated support zone area does become an area of exposure potential, the Contractor shall reconfigure the site layout and/or modify operations to ensure appropriate exposure controls are maintained. Details for monitoring, and decision-making criteria, for the support zone configuration shall be presented in the Contractor's HSP

The three-zone approach assumes that an appreciable exposure scenario exists. In situations involving negligible exposure potentials (i.e., surface activities), site zoning procedures may be modified following approval of the HSO. In all instances, applicable information will be appropriately communicated to personnel.

No employees will be permitted to enter any exclusion zone or any other area where there is a potential for chemical exposure unless they have the appropriate medical clearance, training, and PPE. Keeping current medical and training documentation onsite will enable the SM and SSO to ensure that unauthorized personnel do not enter a restricted work area. Each SM will be responsible for identifying and controlling the personnel and equipment in their respective work area. This will be accomplished via daily logbook entries. Additionally, all personnel passing through the decontamination trailer (entering the controlled area of the Site) will sign a daily tracking sheet indicating their entrance into the controlled area. All exclusion zone work shall require that the buddy system be used.

6.2 Markings/Signs

The following markings/signs will be used as visual indicators:

- Exclusion Zone Marking

The outer limits of the EZ will be marked by signs or barricades. Each sign and/or barricade shall read "Exclusion Zone - Proper PPE Required". All signs and/or barricades shall be constructed in conformance with 29 CFR 1910.145.

6.3 Communications

Onsite communications will consist of two-way radios operating on a single frequency that will be carried by the SM, SSO, and the TL or foreman of each work crew. A "base station" will be monitored by personnel in the support trailer in the event that an outside emergency agency needs to be notified immediately by telephone.

Emergency telephone numbers and reporting instructions for ambulance, hospital, fire, and police shall be available at the Site. All field personnel shall be briefed concerning the people and equipment to be contacted during an emergency.

An internal communication system consisting of hand signals as well as voice communication shall be adopted by field personnel because of potentially noisy working conditions at the Site. The hand signals suggested to be used during field operations are:

- Hand gripping throat - out of air, can't breathe
- Grip partner's wrist - leave area immediately
- Hands on top of head - needs assistance
- Thumbs up - OK, I am alright, I understand
- Thumbs down - no, negative

6.4 Security

Security procedures will be under the direction of the SM.

The support zone will be established within a fenced-in area. No entry into the support zone by unauthorized personnel will be permitted. All access gates into the support zone will be either locked and/or monitored to ensure only authorized personnel are permitted access. All gates to the support zone will be locked at the end of the workday. No further security measures are anticipated.

7.0 PERSONAL PROTECTIVE EQUIPMENT

7.1 General

As required by OSHA standards, the Contractor shall use engineering and administrative controls as the primary means of exposure control. However, personal protective equipment may be necessary to further minimize potential employee exposure. Decision-making criteria for utilizing PPE shall include:

- Historical information
- Known/suspected contamination
- Work location/duration
- Task being performed/method of operation
- OSHA requirements
- Other requirements as directed by applicable regulations

Throughout the course of activities, PPE requirements may need to be modified (upgraded or downgraded) due to environmental concerns/site conditions (i.e., dusty conditions, visual contamination, exceeding monitoring instrument action levels) and/or if additional analytical data becomes available which suggests an increased or decreased level of hazard. All modifications will be directed by the SSO with approval from the HSO.

OSHA requirements (29 CFR 1910.120) dictate that when PPE is used, a PPE program be developed. Similarly, separate requirements are dictated by OSHA for respiratory protection. However, it is realized that there is much overlap between PPE and respiratory protection, since respiratory protection is in fact a facet of PPE. To address these OSHA requirements, the Contractor shall develop a written PPE and respiratory protection program as part of the Contractor HSP.

7.2 General Levels of Protection

The levels of protection utilized during the remedial action may vary depending upon the means and methods selected by the contractor. The levels specified in this HSP shall be considered guidelines.

7.2.1 Respiratory Protection

The primary respiratory protection expected to be used are full-faced air purifying respirators equipped with combination organic vapor/HEPA cartridges for removing organic vapors, dusts, mists, and fumes. The Contractor's respiratory protection program shall follow the OSHA guidelines in 29 CFR 1910.134. The guidelines to be followed when using Level C respiratory protection include:

- Air purifying cartridges will be replaced at the end of each shift or as needed.
- Only employees who have had a pre-issue qualitative fit test will be allowed to work under Level C respiratory protection.
- Employees will have been instructed and trained in the proper use of respirators and their limitations.
- Only employees who have passed a medical examination, including a pulmonary function test, will be allowed to use Level C respiratory protection.
- Conditions that prohibit a proper seal between the respirator and face (e.g., facial hair, eyeglasses with earpieces, etc.) will not be allowed. The wearer should check the facepiece fit every time he or she puts on the respirator.
- Respirators shall be regularly cleaned and disinfected.
- Respirators used routinely will be inspected during cleaning and worn or deteriorated parts will be replaced.
- Respirators will be stored in a convenient, clean, and sanitary location.

7.2.2 Summary of PPE Required per Task

The following table illustrates the minimum level of PPE recommended for each activity identified in this HSP. Table 7-1 provides a description of the individual items required for each level of protection. Section 8.3 provides the decision logic (Action Levels) for upgrading and/or downgrading the initial level of protection.

	Initial Levels of Protection	Potential Levels of Protection
Mobilization	D	D
Setup of Equipment	D	Modified D
Earth Handling Activities/Trenches Inside Remedial Boundary	C	B; Modified D
Pipe Construction/Installation	C	B; Modified D
Well Installation	Modified D	B; C; Modified D
SVE Construction	D C	C; Modified D
SVE Operations/Maintenance	D	C; Modified D
Cap Installation	Modified D	C; D
Decontamination	C	Modified D
Demobilization	D	D

TABLE 7-1					
PERSONAL PROTECTIVE EQUIPMENT					
PPE Required	Levels of Protection				
	D	Modified D	C	Modified C	B
Job Issue Cotton Coveralls	X	X	X	X	X
Eye Protection Meeting ANSI Z87.1	X	X			
Hard Hat	X	X	X	X	X
Steel Toe Boots	X	X	X	X	X
Tyvek/PE Coveralls		X	X		X
Rubber Boots/Boot Covers		X	X		X
Inner Surgical Gloves (Latex/Nitrile)		X	X		X
Outer Nitrile Gloves		X	X		X
Full Face Respirator w/GMC-H* Cartridges			X	X	
Self-Contained Breathing Apparatus					X
Duct Tape All Joints		X	X		X
As Needed					
Leather or Cotton Work Gloves	X	X	X	X	X
Hearing Protection	X	X	X	X	X

Notes

* Combination organic vapor/HEPA cartridges

8.0 AIR MONITORING/SAMPLING REQUIREMENTS

8.1 Perimeter

Perimeter air monitoring/sampling will be conducted in accordance with the project Air Monitoring Plan and is not addressed herein.

8.2 Industrial Hygiene Sampling

Eight-hour TWA samples which are representative of the level of exposure of personnel involved in onsite work activities where personnel may be exposed to hazardous levels of airborne chemicals will be collected and analyzed. Samples will be collected from the breathing air space of the employee within a 1-foot radius of the head. Personal monitoring pumps shall be attached to workers who have the highest expected exposure. Two "maximum risk employees" shall be selected for each operation to determine the maximum exposure limits. Maximum risk employees are defined as those onsite workers who are performing tasks closest to the expected or suspected source(s) of potential contamination. Additional personnel sampling of other employees shall be performed if the "maximum risk employee(s)" of an operation are found to be working at or above one-half of an established OSHA Permissible Exposure Limit.

Personnel TWA sampling shall be done in accordance with acceptable NIOSH methods and analysis conducted by an AIHA accredited laboratory. The Contractor's CIH shall determine the compounds to be sampled and analyzed for and shall develop a sampling plan for the Contractor's HSP. Results shall be available within 48 hours of sampling, or the next scheduled work day.

Personnel TWA sampling initially shall be done on a daily basis for three days during active work in the Northern, Central, and Southern areas of the site. Following this initial period, sampling shall be conducted not less than once per work week during intrusive activities when potential exposure is expected to be the greatest. However, if the data generated during the initial sampling indicates that exposures are not significant, the HSO may terminate the integrative sampling and document exposures through the use of real-time instruments.

8.3 Real-Time Ambient Air Monitoring

Organic vapors and lower explosive limit/oxygen percentage will be monitored throughout the project. The primary purpose of this monitoring is to provide immediate feedback to the SSO regarding potential exposures during intrusive activities so that actions can be taken, if necessary, to reduce vapor releases in the work area. Monitoring data will be collected for these parameters throughout all intrusive site activities initially on an hourly basis. This frequency may be adjusted based on site conditions and the professional judgement of the SSO. However, at a minimum, real-time reading will be taken at the beginning of every workshift and when site conditions change.

Real-time monitoring will include the following equipment. VOCs will be monitored using a Thermo Environmental Instruments, Inc. Model 580S PID with an 11.7 eV lamp or its performance equivalent. Lower explosive limits (LEL) and oxygen concentrations will be monitored using an MSA Model 261 LEL/O₂ meter or its performance equivalent. The LEL/O₂ meter is used to detect oxygen-deficient, oxygen-enriched, and combustible atmosphere. Particulates will be monitored using an MEI mini-ram or its performance equivalent. The mini-ram will be used to document respirable dust exposure during concrete crushing operations and/or during material handling activities where visible emissions are occurring.

All monitoring instruments will be calibrated daily in accordance with the manufacturer's recommendations.

All real-time perimeter air monitoring will be conducted according to the project air monitoring/sampling plan.

Colorimetric detector tubes will be kept onsite by the Contractor. Tubes will be available for the chemicals of concern for the Site. They will be utilized upon an indication of a PID reading of 5 ppm for the purpose of qualitatively determining which chemical potential exposure exists and to determine what type of respiratory protection is appropriate.

A daily log will be kept at the Site to record all monitoring data. The data will be summarized as part of a daily report, including parameter, instrument type, air concentration measured, time, and location.

Table 8-1 provides the minimum action levels to be utilized for this project. The Contractor's CIH shall review these levels and determine if more protective levels are necessary.

TABLE 8-1**MONITORING INSTRUMENT ACTION LEVELS
UNLESS OTHERWISE DIRECTED**

	Air Quality Measurement	Response
I. Exclusion Zone Action Level - Volatiles		
PID	0 - 5 ppm above background in breathing zone	Level D
PID	5 - 10 ppm above background in breathing zone	Level C
PID	Above 10 ppm above background in breathing zone	Level B
Action Level - Combustible Atmosphere		
CGI	Less than 10 percent LEL unknowns	Normal monitoring
CGI	Greater than 10 percent LEL unknowns	Continuous monitoring Check offsite impact
CGI	Greater than 20 percent LEL unknowns	Stop work
Action Level - Colorimetric Detector Tubes		
Specific Contaminant	1/2 Applicable Exposur Limit	Level C
Specific Contaminant	Greater than 10 times Applicable Exposure Limit	Stop work; consult HSO
Action Level - MIE Mini-Ram		
Mini-Ram	0 - 1 mg/m ³ above background	Level D
Mini-Ram	1 - 5 mg/m ³ above background	Level C
Mini-Ram	> 5 mg/m ³ above background	Level C - initiate dust suppression. Notify HSO

9.0 DECONTAMINATION PROCEDURES

Decontamination of equipment and personnel will be performed to extend the useful life of safety equipment, to prevent cross contamination of samples, and to prevent worker exposure to hazardous substances. All decontamination activities will be carried out within the contamination reduction zone, and any residuals generated (i.e., decontamination water, disposable gloves, disposable suits, etc.) will be placed in secure containers for disposal in accordance with local, state, and Federal regulations.

9.1 Equipment Decontamination

9.1.1 Decontamination Pad

A decontamination pad has been constructed as a washdown area for all materials, equipment, and vehicles used in the exclusion or contamination reduction zones.

The equipment/vehicles will be placed (driven) onto the decontamination pad and the proper wash/rinse procedures shall be followed. All waters will drain to a collection sump and shall be transferred to the onsite wastewater storage tanks.

The sides of the decontamination pad will be enclosed with plastic sheeting, if necessary, to control the spray from the pressure washer and hoses.

The equipment/vehicles will be held for a short period of time to allow for the drippings to be retained in the collection basin. Equipment will then be permitted to be removed from the CRZ to a clean area.

All equipment/material decontamination activities will require the use of poly-coated Tyvek or its performance equivalent for the purpose of splash protection. Also splash shields must be utilized during decontamination procedures.

9.1.2 Small Equipment Decontamination

- Small equipment such as that associated with sampling or excavation (shovels, picks, chisels, hammers, etc). will be transported from the exclusion or contamination reduction zones to the decontamination pad after use.
- Equipment will be washed with a high pressure spray.
- If the equipment does not appear to come clean, it will then be scrubbed down with soapy water using brushes and a phosphate-free soap. Equipment will then be rinsed, by hose, with water.
- Equipment will then be allowed to air dry.

9.1.3 Large Equipment Decontamination

- Large equipment such as backhoes, loaders, graders, dozers, and drill rigs shall be driven or carted from the exclusion or contamination reduction zones to the decontamination pad.
- Equipment will first be washed with a high pressure spray.
- If the equipment does not appear to come clean, it will then be scrubbed down with soapy water using brushes and a phosphate-free soap. Equipment will then be rinsed, by hose, with water.
- Equipment will then be allowed to air dry.

9.2 Personnel Decontamination

9.2.1 Personnel

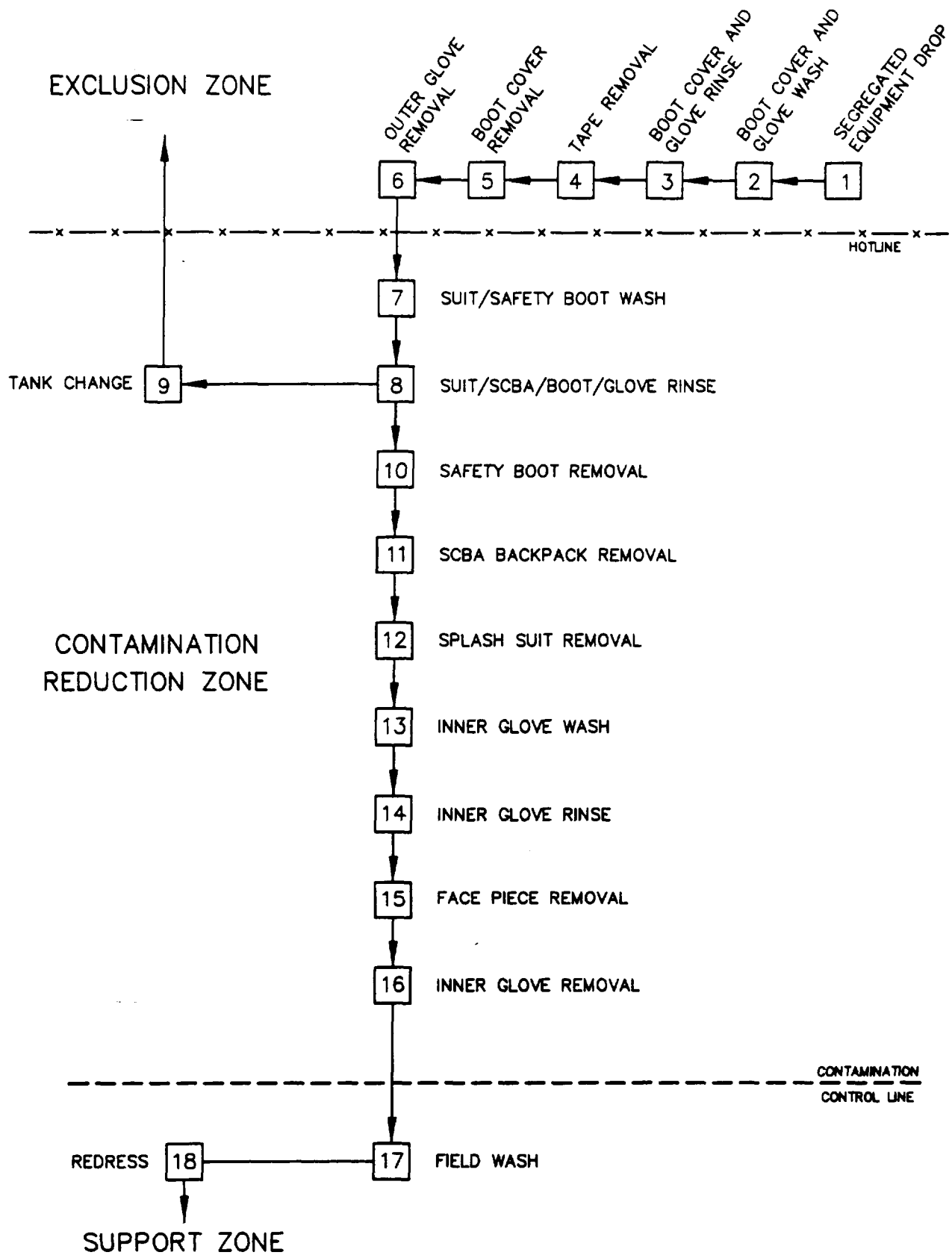
Prior to any breaks, after exit from the EZ, personnel must wash hands and face, especially if any hand-to-mouth activities are expected, i.e., smoking, drinking, or eating.

All personnel who have entered the EZ or CRZ will be required to shower at the end of the day before leaving the Site. However, this requirement does not apply to those individuals entering the EZ or CRZ inside of a vehicle for brief periods (i.e., truck drivers), upon approval of the SSO.

9.2.2 Equipment

Personnel decontamination will consist of soap and water washings to remove contaminants from reusable protective gear (i.e., neoprene boots, chemical-resistant gloves, and full-faced respirators). Disposable protective apparel will be removed in a manner that will prevent the spread of contaminants to other clothing (i.e., remove gloves by turning them inside out).

The detailed procedure for personnel decontamination will depend on the level of respiratory and dermal protection required for the specific work task. The general sequence of decontamination and removal of protective apparel is illustrated in Figures 9-1, 9-2, and 9-3. The extent of washing required or modifications to the sequence will be specified by the SSO.



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DECONTAMINATION PROCEDURES LEVEL B PROTECTION

ENVIRO-CHEM SUPERFUND SITE

ZIONSVILLE, IN

CLIENT: ENVIRONMENTAL CONSERVATION & CHEMICAL CORP. TRUST JOB NUMBER: 2455-002

SCALE: NONE

FIGURE
NUMBER

9-1

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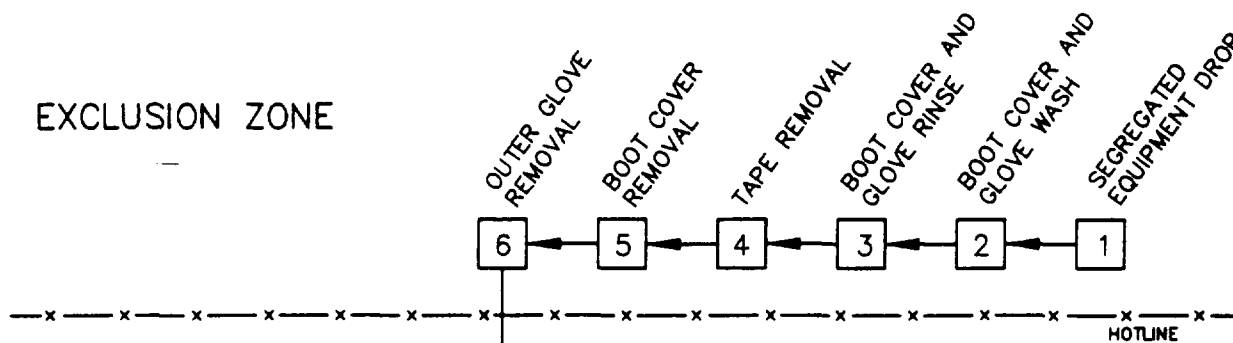


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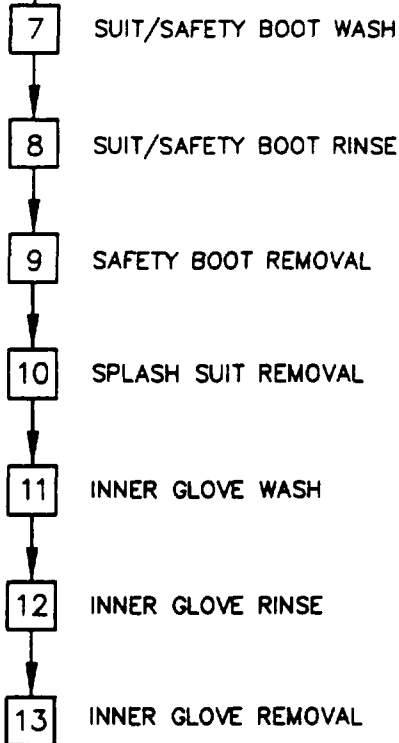
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EXCLUSION ZONE



CONTAMINATION
REDUCTION ZONE



SUPPORT ZONE



Dow Environmental

DECONTAMINATION PROCEDURES MODIFIED LEVEL D PROTECTION

ENVIRO-CHEM SUPERFUND SITE

ZIONSVILLE, IN

CLIENT: ENVIRONMENTAL CONSERVATION & CHEMICAL CORP. TRUST

JOB NUMBER: 2455-002

SCALE: NONE

FIGURE
NUMBER

9-3

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9.3 Community Public Health Preservation

The health concerns for the community are of utmost concern. Precautions undertaken to prevent any contamination from leaving the Site shall include:

- All equipment (mobile and portable) will be decontaminated before leaving contaminated areas.
- Suspended solids in surface runoff will be prevented from migrating offsite.
- Dust suppression techniques will be used as necessary to keep dust levels at a minimum.

10.0 STANDARD OPERATING PROCEDURES

10.1 General

The following Standard Operating Procedures (SOPs), engineering controls, and/or work practices are to be enforced during work onsite:

- All personnel are responsible for complying with all applicable regulations (i.e., OSHA) for employing safe operating procedures while performing their duties. A copy of all applicable OSHA regulations will be kept onsite.
- All personnel must attend site-specific training prior to working/visiting in the EZ or CRZ.
- All personnel must conduct their activities in a manner pursuant to the contents of this HSP. Violations of HSP requirements will be brought to the attention of the TL by the SSO. If satisfactory results are not obtained, the SM and PM will be advised. Any violation of this HSP may be considered grounds for dismissal.
- All personnel must satisfy medical surveillance requirements prior to working in an area where the potential for exposure exists.
- Any person using prescription or non-prescription drugs must first notify the SSO so that it can be determined that these drugs do not potentiate the effects of site contaminants.
- No one may use cosmetics while onsite as these can potentiate the effects of some chemical substances.
- Eating, drinking, smoking, chewing gum or tobacco, or any other hand-to-mouth activities are prohibited in the EZ and/or CRZ due to the potential for contaminant ingestion.

- Upon leaving any designated EZ, personnel must thoroughly wash their hands and face as soon as possible, following personnel decontamination.
- Any unnecessary contact with potentially-contaminated substances must be avoided. This includes contact with potentially-contaminated surfaces and/or equipment. Monitoring instruments and other hand-held items are not to be placed on ground surfaces or other potentially-contaminated surfaces.
- No facial hair, which can interfere with achieving a satisfactory face-to-facepiece seal with respiratory protection equipment, is permitted on any person required to use such equipment.
- Monitoring instrument action levels shall be observed.
- If personnel note any warning properties of chemicals or even remotely suspect the occurrence of exposure, they must immediately notify the SSO for further direction.
- Work cessation due to electrical storms, high ambient heat loads, or other such adverse weather conditions shall be determined by SM and SSO.
- No open fires will be permitted.
- Site personnel are not to undertake any activity which would be considered a confined-space entry without first being trained in the proper procedures by the SSO and completing a confined space entry permit.
- Any areas targeted for subsurface investigation must first be investigated to determine the presence of underground utilities. This information is to be documented in the appropriate TL's logbook.
- No equipment shall be operated within a 20-foot radius of energized power lines.
- No one, under any circumstances, shall enter an excavation without a confined space/limited egress permit and adequate sloping and/or shoring.

- Site rules (buddy system, safety checks before leaving field office, before entering EZ, etc.) shall be enforced.
- Eating and smoking shall be prohibited in the EZ and CRZ.
- Wearing contaminated protective apparel in the support zone and restrooms shall be prohibited.
- Before initiating any non-routine operation in any restricted area, all personnel shall consult the SSO about health and safety requirements for the operations.
- A buddy system shall be implemented for all work in the EZ, including the activities during the pre-operational start-up period.
- The Contractor shall provide an emergency shower facility for wholebody washdowns and eye wash in the event of an emergency in conformance with ANSI Standard Z358.1-1981. The eye wash shall supply a minimum of 0.4 gallons per minute (gpm) of water for 15 minutes.
- Physician-approved first-aid kits shall be kept onsite during onsite work. At a minimum, one kit shall be placed in the health and safety office.
- First-aid equipment shall be approved by physician and be able to provide stabilization for patients requiring offsite treatment and general first aid.
- The Contractor shall provide and maintain, at a minimum, one 20-pound Type ABC fire extinguisher at each work area. Additionally, all heavy equipment and all dedicated site vehicles shall be equipped with a 10-pound Type ABC fire extinguisher.
- All work areas shall be adequately illuminated by either natural or supplementary electrical lighting. The minimum illumination level in any active work area (i.e., active exclusion zone) shall be 10-foot candles. All other areas of the Site shall be illuminated according to the requirements of 29 CFR 1910.120(m).

- All electrical installations shall conform to the National Electric Code, 29 CFR 1926 (Subpart K).
- All loading and unloading of materials onsite shall conform to the requirements of the U.S. Department of Transportation (DOT). These requirements shall include grounding and bonding during flammable liquid transfers; proper placarding of any vehicle transporting hazardous materials from the Site; ensuring all drivers meet DOT driver qualifications; and ensuring that all vehicles being loaded or unloaded are secured from inadvertent movement according to DOT and OSHA requirements.

10.2 Confined Space

The Contractor shall prepare a written program for confined space entry which meets the requirements of 20 CFR 1910.146 prior to performing any activity which could be considered a permit required confined space entry (i.e. entering an excavation, cleaning out frac tanks, etc.).

10.3 Underground Storage Tanks (UST)

Upon determination of a UST present in the work area, all activities shall cease in the immediate vicinity and the SM notified immediately. No work around the UST shall commence until an amendment to this HSP has been completed and approved.

10.4 Underground Utilities

If any underground utilities are unexpectedly located, cease all activity and notify the SM. The SM will be responsible for contacting the appropriate utility company if need be. Work will not continue until a proper location of the existing utility can be attained and/or any damage repaired and work can continue in a safe manner and without further damage.

10.5 Illumination

If practical, all major work tasks will occur during daylight hours. The illumination requirements set forth by OSHA in 29 CFR 1910.120(m) will be met.

10.6 Sanitation

10.6.1 Potable Water

- An adequate supply of potable water shall be provided onsite by the Contractor.
- Portable containers used to dispense drinking water shall be capable of being tightly closed and equipped with a tap. Water shall not be dipped from the container.
- Containers used to distribute drinking water shall be clearly marked and not used for any other purpose.
- Common cups are prohibited for distribution of drinking water; single service cups are required unless workers provide their own cups or a water fountain is available.
- When single service cups (to be used but once) are supplied, both a sanitary container for the unused cups and a receptacle for disposing of the used cups shall be provided.

10.6.2 Non-Potable Water

- Outlets for non-potable water shall be identified to clearly indicate that the water is unsafe and is not to be used for drinking, washing, or cooking purposes.
- There shall be no cross-contamination between potable and non-potable water systems.

10.6.3 Toilet Facilities

- The Site shall be provided with portable chemical toilets (i.e., Port-O-San toilets) with appropriate service.
- Toilet facilities shall be provided for employees as follows:
 - Twenty or fewer employees: one facility
 - More than 20, fewer than 200: one toilet seat and one urinal per 40 employees
 - More than 200: one toilet seat and one urinal per 50 employees

10.6.4 Food Handling

Food handling on the Site will be permitted only in the support zone and break area as delineated by the SM/SSO. All personnel who have entered the CRZ or EZ will be required to wash hands and face before handling food or eating.

10.6.5 Showers

Showers will be provided and maintained in a sanitary condition. Each employee who has worked in the CRZ or EZ will be required to shower prior to leaving the Site for the day.

11.0 EMERGENCY RESPONSE PLAN

This section provides information regarding the recommended action(s) to be taken by site personnel in the event of certain reasonably foreseeable emergencies. The information provided in this section should not be construed as all inclusive as each emergency situation may be unique and should not take precedence over professional judgements made during an incident. This section provides guidance so that the Contractor can prepare his own ERP.

11.1 Pre-Emergency Planning

Pre-emergency planning for this project will involve the following:

- Development and approval of this ERP and a corresponding Spill and Discharge Control Plan (SDCP).
- Coordination of the ERP with local health and emergency response agencies.
- Training of site personnel in appropriate emergency procedures.
- Modification of the ERP, whenever necessary, as conditions change.

11.2 Anticipated Types of Emergencies

Various emergency situations could possibly occur during remedial activities. These situations include:

- Fire/explosion
- Personal injury/illness
- Chemical spill
- Chemical releases to offsite receptors

The remaining sections of the plan provides information and procedures to be followed in the event any of these scenarios occur (individually or in tandem).

11.3 Lines of Authority, Personnel Roles, and Communication

The lines of authority and responsibilities for emergency action will coincide with the health and safety responsibilities discussed in the HSP. The Site Manager has overall authority for implementation of this ERP and all site emergency actions. This authority will be supplemented by input from the SSO who will act as second in command during emergency situations.

Specific roles and responsibilities to be carried out by site personnel will directly correlate to the nature of the incident. Site workers will be utilized to carry out the various response (or non-response) operations.

Communications during site emergencies will include the following:

- Site communications using alarms and radios
- Offsite communications with local health and emergency response agencies via telephones

Each team working at the Site, as well as the Site Manager and SSO, will carry portable two-way radios capable of communicating from a single site frequency. Additionally, as per the HSP, an air horn will be installed onsite to alert site personnel of emergency situations. The following signals will be used:

- Site Evacuation - One long blast for at least 10 seconds
- Emergency - Shorts blasts for at least 10 seconds

Once the situation has been evaluated, local emergency response agencies will be notified, as necessary, via the telephone. Telephones will be located at the site office. Specific protocol, as to who is to be notified in the event of a site emergency, is presented in the emergency alerting provisions of this ERP.

11.4 Training

During site-specific training, all site personnel will receive the level of training necessary for them to safely and effectively carry out their roles as specified in this plan. Personnel who are merely to evacuate to a safe location during incidents will be provided information regarding safe distances and places of refuge. Other persons, who will actually respond to the incidents, will be trained in the specific response procedures and equipment to be used, such as use of fire extinguishers and control and containment (as described in the SDCP).

11.5 Emergency Recognition and Prevention

Many emergencies can be prevented by compliance with the HSP, the SDCP, and all relevant regulatory standards. However, it is recognized that such emergencies can arise. Visual observation, employee complaints, and/or air monitoring as per the AMP can aid individuals in identifying, recognizing, and initiating response to emergencies.

11.6 Safe Distances and Places of Refuge

Safe distances and places of refuge will correlate to the wind direction, topography, and the incident. Personnel will be advised to move to an upwind location at least 300 yards from any fires and/or chemical releases, and will be advised to continually monitor wind direction for changes (the crew leader will account for respective personnel). If moving upwind from these types of incidents is not possible without encountering the incident and subsequent exposure potential, personnel will be advised to move crosswind or downwind to a distance necessary to be out of the path of smoke, odors, or releases. During personal injury/illness incidents (unless they involve fires or chemical releases), distances from incidents will be such to prevent interference with emergency response.

11.7 Site Security and Control

Site security will consist of a person or several people designated by the Site Manager to control entry/exit of personnel and equipment to the Site during work hours. Security personnel will execute and enforce the Security Plan. Site security personnel will coordinate the arrival of any outside emergency services. Unauthorized persons will not be permitted to enter the Site during routine work operations or during emergencies.

11.8 Evacuation Routes and Procedures

All personnel will assemble at the primary rally point, unless otherwise instructed, in the event that site evacuation becomes necessary. An secondary rally point will be identified (in support zone). The Site Manager will be responsible for roll call, i.e., personnel accountability.

11.9 Decontamination

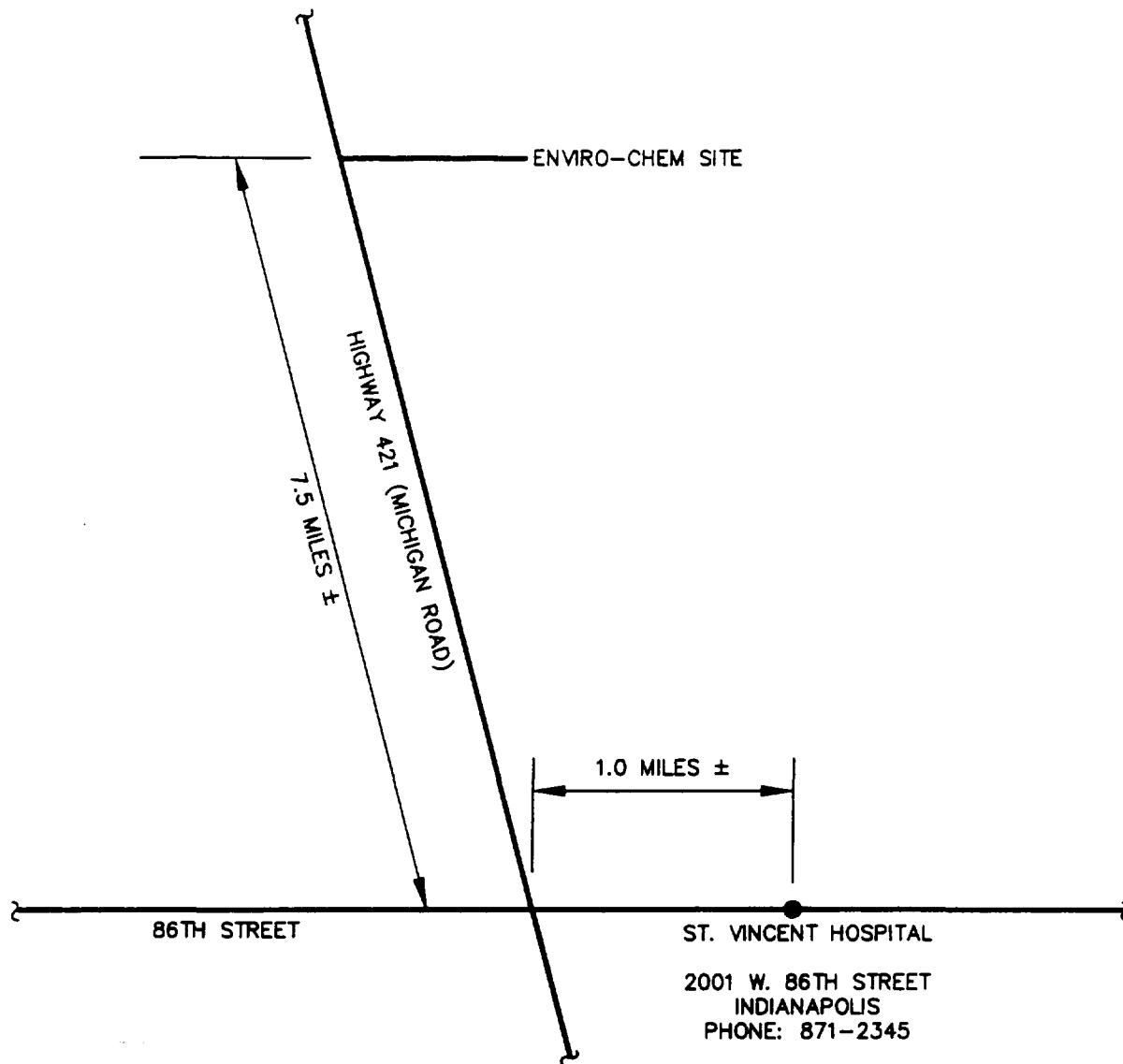
Decontamination during site emergencies will be the same as that for routine site operations, unless there is potential threat to human life or health. In such a situation, decontamination will consist of contaminated clothing removal and wrapping the injured party in a blanket. The vehicle used to transport the victim(s) to the medical facility will therefore be restricted in contacting contamination, and as such, should not be required to undergo decontamination.

11.10 Emergency Medical Treatment and First Aid

All emergency medical treatment, other than first aid, will be administered by the Paramedic Services dispatched through the emergency dispatch system. This treatment will continue during transportation to the hospital. All first aid will be administered onsite by the SSO who ^{must} be certified in CPR and first aid by the American Red Cross. Physician-approved first-aid supplies will be maintained at various locations throughout the project site. All vehicles used to transport injured persons to the offsite medical facility will be provided with directions and a map to the facility. Additionally, the HSP will accompany the affected individual to the emergency care center. Figure 11-1 illustrates the route to the hospital from the Site.

11.10.1 Emergency Physician Access

In the event that any medical emergency arises due to work-related injuries/illnesses, a 24-hour emergency physician access plan will be established to enable any employee to communicate with the medical consultant.



FILE: \ECC\HOSPITAL 80400000



HOSPITAL ROUTE

ENVIRO-CHEM SUPERFUND SITE

ZIONSVILLE, IN

CLIENT: ENVIRONMENTAL CONSERVATION & CHEMICAL CORP. TRUST JOB NUMBER: 2455-002

SCALE: NONE

FIGURE
NUMBER

11-1

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11.11 Emergency Alerting Procedures

In the event of an emergency, the appropriate response agencies will be notified and appropriate project personnel will be notified as determined in advance. Table 11-1 provides the telephone numbers for the appropriate outside agencies.

11.12 Response Procedures (Priorities and Responses)

The following provides guidance toward prioritizing action and provides general response procedures to be followed. This information coupled with the SDCP should provide adequate information for the degree of response anticipated by employees. It is expected that personnel would only provide *minimal or first line response* to all emergencies.

11.12.1 First Priority

Prevent further injury/illness by:

- Protecting response personnel
- Isolating the scene to authorized personnel only
- Rescuing any injured parties
- Notifying Outside Emergency Assistance

11.12.2 Second Priority

- Provide first aid to those persons with life-threatening injuries or illnesses.

11.12.3 Third Priority

Alleviate the immediate hazards by:

- Extinguishing incipient stage fires
- Reducing chemical releases
- Containing any spill

TABLE 11-1

EMERGENCY REFERENCE NUMBERS

This site location (EMS address):

865 South, State Route 421,
Zionsville, Indiana

Emergency Information	Location	Telephone Number
Office	Indianapolis	(317) 469-0703
Ambulance	Zionsville	(317) 873-3363
Hospital Emergency Room	St. Vincent	?
Hospital General Information	St. Vincent	(317) 871-2345
Police/Sheriff's Department	Zionsville	(317) 873-2233
Fire Department	Zionsville	(317) 873-3344
HAZMAT Team (Local)	Zionsville	(317) 241-4336
Site Manager		
Health and Safety		
Poison Information Center	National	1-800-762-0727
National Response Center for Environmental Emergency Only	National	1-800-424-8802
Boone County Health Department		(317) 482-3942
Project Manager	Office	
Corporate Health and Safety Manager	Home	
IDEM Emergency Response	Indianapolis	(317) 241-4336
U.S. EPA Project Manager	Chicago	312/886-4663

911

911

911

11.12.4 Fourth Priority

- Provide first aid to all injured or ill parties and continue efforts to alleviate the hazard.

11.13 Small Fires

A small fire is defined as a fire that can be extinguished with the available 20-pound type ABC fire extinguisher. In the event of a small fire, the following minimum actions shall occur:

- Evacuate all unnecessary personnel from the area, if possible, to an upwind location or to an area not affected by airborne contaminants if an upwind location is not feasible.
- Attempt to extinguish fire using portable fire extinguisher or by smothering.
- Request emergency response assistance (ambulance, fire, hospital, poison control center) as needed for any injuries or exposures to hazardous chemicals.
- Notify the Contractor.

11.14 Large Fires

In the event of a large fire or a small fire which cannot be extinguished, undertake the following minimum actions:

- Evacuate all unnecessary personnel from the Site, preferably to an upwind location.
- Order the appropriate level of protective clothing to be worn by personnel near the fire.

- Notify the fire department and other emergency response services (police, ambulance, hospital, poison control center) as needed.
- Notify the Contractor.

11.15 First-Aid Procedures

11.15.1 Physical Injury

- For minor injuries, routine first-aid procedures shall be used immediately. If required, the onsite emergency vehicle shall be used to transport patient to the hospital.
- For major injuries, an ambulance shall immediately be called and paramedics shall assess the nature and extent of the injury. In case of severe injury occurring along with chemical contamination of the victim, the victim shall be sprayed down with a water hose, or have the contaminated garments removed, or be wrapped in a blanket to prevent the spread of contamination, prior to being transported in the ambulance.
- In the event of bleeding, broken bones, shock, burns, heat exhaustion, heat stroke, seizure, insect stings, etc., the trained personnel shall use Red Cross approved measures for treatment.

11.15.2 Chemical Injury

- Appropriate safety gear shall be worn when treating the victim.
- The victim shall be removed to fresh air and resuscitated, if necessary.
- If clothing is chemically contaminated and injuries permit, clothing shall be removed and the skin flooded with copious amounts of water.

- If the eyes are contaminated, they shall be irrigated immediately with copious amounts of water for 15 minutes minimum.
- Call the nearest Poison Control Center for technical advice and assistance.

11.16 Emergency PPE and Equipment

The following inventory of PPE and equipment will be maintained onsite in sufficient quantities and locations to ensure an adequate supply for all emergency response personnel and to ensure that it is readily accessible:

- Industrial first-aid kit - one in the main CRZ and one in the site office
- Eye wash and deluge showers - located near each work area and the main CRZ
- Stretchers - located at the support zone
- Fire extinguishers - located at the entrance to each work area and in all trailers
- Pressure-demand self-contained breathing apparatus - two or more
- Four spare cylinders for SCBAs
- Tyvek/PE coveralls
- Boot covers
- Nitrile outer gloves
- Duct tape
- Face-shields
- Solvent- and oil-absorbent pads and brooms

11.17 Emergency Response Drills and Critiques

Emergency response drills will be conducted periodically throughout the course of work to be used as measures for evaluating the effectiveness of the ERP and response personnel. Each drill will be critiqued by one or more observer. The critique(s) will then be used to modify, as necessary, the ERP emergency equipment and/or response training.

12.0 SPILL RESPONSE, CONTROL, AND CLEANUP

This section provides contingency procedures to respond to spills of construction-related materials (solid or liquid) at the Site. These procedures are designed to remediate contamination that may result from a spill and to prevent further contamination of surface water, groundwater, soil, structures, equipment, or other materials.

12.1 Spill Control Equipment

Spill control equipment and cleanup materials will be onsite and readily available in the event of a spill. Storage locations for spill control equipment and cleanup materials will be determined in the field during mobilization. Storage locations will be clearly identified. These locations may be relocated as construction activities shift. Also, individual pieces of equipment may be moved from one location to another based on ongoing construction activities.

12.2 Training

Only persons trained in accordance with OSHA 29 CFR 1910.120e(7) will be equipped with the proper personal protective equipment and will perform cleanup procedures for spills. The SSO will determine the level of protection needed for a spill incident based on the circumstances. The air monitoring action levels presented in Section 8.3, Real-Time Air Monitoring, will be followed during any spill cleanup.

Persons involved in spill control and cleanup will be trained in the use of spill control equipment and cleanup materials.

12.3 Onsite Spill Response Procedures

In the event of a spill of potentially contaminated material, the procedures described below will be implemented.

Notification

The Contractor will immediately notify the U.S. EPA Project Manager and the ECC Project Manager of a significant spill if it threatens the offsite environment. If the spill is reportable and/or human health or the offsite environment are threatened, the Contractor will immediately contact the following agencies, as appropriate, in the order listed:

- Indiana Department of Environmental Management, Emergency Response
- Citizen Notification Contact as specified by the U.S. EPA Project Manager
- U.S. EPA Region V Response and Prevention (Spill Control)
- U.S. Coast Guard National Response Center

Spill Control/Containment

In the event of a spill, the first step will be to contain the spill to one area and prevent it from entering any natural or manmade waterways such as streams, manholes, and catch basins. To contain the spill, a dike will be placed around the source of the spill. The dike can be constructed of absorbent material or dirt. A common practice is to form a second dike around the first dike in case there is more material than the first dike can contain.

Once the area around the spill is contained, the source of the spill should be stopped by plugging, turning off the shutoff valve, and overpacking. This will only be attempted by trained persons to minimize risk to workers' personal safety.

Spill Cleanup

Once the spill is contained and controlled, the actual cleanup of the material can begin. Absorbent materials such as speedi-dry, absorbent pads, pillows, and booms may be used to absorb liquid material. Sand may also be used. Spark-resistant shovels will be utilized when picking up potentially contaminated materials.

Cleaned up materials can be either packed in drums or placed on a polyvinyl liner and covered with a polyvinyl cover.

Decontamination of Equipment/Structures/Materials

Any spill control or construction equipment, onsite structures, or other materials which come into contact with the spilled material will be decontaminated, as necessary. Complete cleanup may require showers and cleansing or disposal of clothing and equipment.

Disposal

All contaminated materials, including solvents, cloth, soil, and wood that cannot be decontaminated will be properly containerized, labeled, and disposed of as soon as possible and in accordance with applicable Federal, state, and local regulations. Disposal will be coordinated with provisions of the Materials Handling procedures presented in the Environmental Protection Plan.

Spill Incident Report

A spill incident report will be submitted to the U.S. EPA Project Manager and IDEM within 24 hours of the incident. This report includes information on the date the spill occurred, the type, quantity and location of spilled material, the cause of the spill, cleanup actions, and outside agencies involved.

In addition to the spill incident report, the Contractor will document all spills on site drawings and submit these drawings to the U.S. EPA Project Manager and IDEM when the project is completed.

12.4 Response to Offsite Spills

Despite all precautionary measures, the possibility exists that spills of decontamination water or wastes being transported offsite may occur. This section describes contingency procedures to respond to such incidents.

Decontamination Water

Because decontamination activities and treatment of decontamination water will be performed onsite, it is anticipated that any spills of decontamination water will be onsite. In the event that a spill of decontamination water occurs at the site perimeter and some liquid escapes beyond site boundaries, the emergency equipment and cleanup material onsite will be utilized to respond to both the onsite and offsite portions of the spill.

Transportation-Related Wastes

All contaminated waste material destined for offsite disposal will be transported by a hazardous waste transporter. Before awarding the subcontract, the Contractor will confirm that the transporter has a current, valid hazardous waste transporter identification number. The Contractor will also verify that the transporter has established contingency plans to respond to a transportation-related spill. The ECC Project Manager must approve the offsite transporter and disposal facility.

Cleanup of spills of waste material being transported offsite will be the responsibility of the transporter. If requested, the Contractor will provide additional information on the spilled material (if available) to enable a more expeditious cleanup.

If a discharge of material from a transporting vehicle occurs while in transit offsite, the following actions are expected to be taken to reduce potential migration of the waste material:

- The driver will immediately notify his office and the Contractor.
- Immediate measures will be taken to contain the discharge.
- The point of discharge will be secured and/or eliminated, if possible.
- The driver will remain with the vehicle, keep unnecessary people away, isolate the hazardous area, and deny entry to unauthorized personnel.
- All personnel will stay upwind, keep out of low areas, and not contact the spilled material as much as possible.

- Local authorities and the local hazardous materials response unit will be contacted.
- Other actions will be taken, as advised.

Notifying the proper authorities that a transportation-related spill has occurred is the responsibility of the transporter. After the transporter informs the Contractor of a spill, the Contractor will notify the U.S. EPA Project Manager, IDEM, and the ECC Project Manager. The Contractor will provide additional information as it becomes available.

13.0 ONSITE REFERENCE/DOCUMENTATION RECORDKEEPING AND REPORTING

The following section provides requirements and procedures that must be instituted for onsite health and safety references, documentation, recordkeeping, and reporting.

13.1 Required References

The following reference material is required to be present in the health and safety file in the site trailer:

- Corporate Health and Safety Manual
- Health and Safety SOPs
- Health and Safety Plan
- Current ACGIH TLV Booklet
- Current NIOSH/OSHA Pocket Guide
- Operational Manual for all health and safety equipment
- 29 CFR 1910
- 29 CFR 1926
- NIOSH/OSHA/USCG/U.S. EPA "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities"
- American Red Cross First Aid and CPR Instructional Manuals

13.2 Required Documentation

- Written Hazard Communication Program which includes Hazardous Material Inventory and MSDSs. The Hazard Communication Program must be completed by the Contractor within 10 working days after notice to proceed is given. The written program will be made available to the ECC Trust's Engineer (Engineer) after such time.
- Applicable training records of all site workers for the following:
 - 40-hour introductory course
 - 8-hour supervisory course
 - 8-hour refresher course
 - Site-specific training
- Medical clearance for all site workers.
- Calibration/measurement logs for all site health and safety equipment.
- Health and safety logbook.
- Air Sampling Results Report to include the following information:
 - Date
 - Type of equipment used
 - Equipment identification
 - Analytical results
 - Personnel and/or area sampled
 - Description of remedial activity
 - Sample Number
 - Miscellaneous informaion
- Respiratory Protection Program which meets the requirements of 29 CFR 1910.134. The Respiratory Protection Program must be completed by

the Contractor within 10 working days after notice to proceed is given. The written program will be made available to the Engineer after such time.

- Personal Protective Equipment Program which meets the requirements of 29 CFR 1910.120. The Personal Protective Equipment Program must be completed by the Contractor within 10 working days after notice to proceed is given. The written program will be made available to the Engineer after such time.
- Hearing Conservation Program which meets the requirements of 29 CFR 1910.95.
The Hearing Conservation Program must be completed by the Contractor within 10 working days after notice to proceed is given. The written program will be made available to the Engineer after such time.
- Fit-test records for all employee on all types of respiratory protection available onsite.

13.3 Daily Information

The following information must be documented on a daily basis for each site worker:

- Operation(s) performed
- Time spent on each operation (\pm 1/2 hour)
- PPE used for each operation (specific)

The following information must be documented on a daily basis for each operation:

- Monitoring equipment used
- Range (maximum and minimum) for each monitor
- Average reading for each monitor

The following information must be documented on a daily basis for the overall project:

- Environmental conditions (i.e., temperature, precipitation, cloud cover, wind speed, wind direction, etc.).
- Attendance of employees.
- Site visitors (include name, affiliation, areas/operation observed, PPE used, training/medical release, and site training received).
- Observations regarding health and safety of each operation.
- Health and safety problems encountered:
 - Personnel
 - Equipment
- Telephone/site meetings
 - Health and safety concerns discussed
 - Health and safety decisions and rationale

13.4 Training Logs

The training log(s) shall include both initial training, followup training, and visitor training. These logs shall include:

- Date
- Employee's name (attendance check) and record of attendance
- Materials covered
- Fit-testing performed and results
- Trainer(s)'s signature

13.5 Accident/Incident Reports

- Injuries, offsite releases, or accidents shall be reported to the CHSM immediately or as soon after control of the situation as possible.

The responsibility of this recordkeeping and reporting rests with the SM, although the SSO will complete the reports with assistance from onsite administrative personnel. Note that since both a health and safety logbook and logs/reports will be kept, the SSO has the option to incorporate completed logs/reports by reference into the health and safety logbook. All documents will be kept onsite in the health and safety file.

APPENDIX D

CONSTRUCTION QUALITY ASSURANCE PLAN

DRAFT

CONSTRUCTION QUALITY ASSURANCE PLAN

REVISED REMEDIAL ACTION

**PRE-FINAL DESIGN
ENVIRO-CHEM SUPERFUND SITE
ZIONSVILLE, INDIANA**

**PREPARED FOR:
ENVIRONMENTAL CONSERVATION AND
CHEMICAL CORPORATION TRUST**

**PREPARED BY:
DOW ENVIRONMENTAL INC.
PITTSBURGH, PENNSYLVANIA**

DEI PROJECT NUMBER 2455.006

OCTOBER 1995

NOTICE

"This document is a portion of the overall design package and, therefore, cannot be referenced, in whole or in part, as a standalone document for any other purpose. As indicated in the cover letter of transmittal for these plans, and the Report of Response to U.S. EPA's comments, these plans will be updated and finalized once the Supplemental Investigation data is evaluated.

TABLE OF CONTENTS

<u>SECTION</u>		<u>PAGE</u>
1.0	PROJECT DESCRIPTION AND SCOPE OF WORK	1-1
1.1	Introduction	1-1
1.2	Final Cover System Construction Rationale	1-1
2.0	PROJECT ORGANIZATION AND RESPONSIBILITY	2-1
2.1	CQA/CQC Management Organization	2-1
2.2	Responsibilities	2-1
2.2.1	Remedial Contractor's Project Manager	2-1
2.2.2	Design Engineering Project Managers	2-3
2.2.3	Construction Manager	2-3
2.2.4	CQC Manager	2-4
2.3	Personnel Qualifications	2-5
2.3.1	General	2-5
2.3.2	Remedial Contractor's Project Manager	2-5
2.3.3	Design Engineering Managers	2-5
2.3.4	Remedial Contractor's Construction Manager	2-5
2.3.5	Inspection (QC) Staff	2-5
2.3.6	ECC Trust's Engineer	2-6
3.0	QUALITY ASSURANCE OBJECTIVES	3-1
4.0	CONSTRUCTION COMPONENT EXAMINATION, MEASUREMENT, AND TESTING	4-1
4.1	Materials Inspection and Certifications	4-1
4.2	Measurements	4-2
4.2.1	General	4-2
4.3	Cover and Backfill Materials Testing and Construction Monitoring	4-3
4.3.1	Materials Testing	4-3
4.3.1.1	Soils	4-3
4.3.1.2	Geosynthetics	4-4
4.3.2	Construction Monitoring	4-6
4.3.2.1	Soils Placement	4-6
4.3.2.2	Geosynthetic Installation	4-9
4.3.3	Geocomposite Drainage Net	4-13
4.3.3.1	Manufacturers Documentation	4-13
4.3.4	Shipment and Storage	4-15
4.3.5	Conformance Testing of Geocomposite Drainage Nets	4-15
4.3.5.1	Sample Collection	4-15
4.3.5.2	Test Results	4-17

TABLE OF CONTENTS (CONTINUED)

<u>SECTION</u>		<u>PAGE</u>
4.3.6	Handling and Placement	4-17
4.3.7	Seams and Overlaps	4-18
4.3.8	Repair Procedures	4-19
4.3.9	Placement of Materials on Geocomposite Drainage Nets	4-20
4.3.10	Erosion Control Revetments	4-20
4.3.10.1	Shipment and Storage	4-21
4.3.10.2	Handling; Placement and Installation	4-21
4.3.10.3	Slope Preparation	4-22
4.3.10.4	Final Aggregate Concrete Injection	4-22
4.4	Monitoring Wells	4-23
4.4.1	Existing Monitoring Well Abandonment	4-23
4.4.2	Compliance Monitoring Well Construction	4-24
4.4.2.1	Confirmatory Test Borings	4-24
4.4.2.2	Construction of Compliance Monitoring Wells	4-24
4.5	Quality Assurance Documentation	4-25
4.5.1	General	4-25
4.5.2	Daily Report	4-25
4.5.3	Submittals Register	4-28
4.5.4	Daily Quality Control Reports	4-28
4.5.5	Non-Compliance Notifications	4-29
4.5.6	Report of Field Change	4-31
4.5.7	Photographic Reporting Data Sheets	4-31
4.5.8	QC Transmittal Form	4-31
4.5.9	Storage of Records	4-32
5.0	FIELD CHANGES AND CORRECTIVE ACTION	5-1
5.1	Field and Design Changes	5-1
5.2	Construction Problem and Corrective Actions Report	5-1
6.0	QUALITY ASSURANCE REPORTS TO MANAGEMENT	6-1
6.1	Construction Activity Reporting	6-1
6.1.1	Progress Reports	6-1
6.1.2	Final Certification of Completion	6-2

TABLE OF CONTENTS (CONTINUED)

<u>SECTION</u>		<u>PAGE</u>
APPENDICES		
A	SAMPLING AND TESTING REQUIREMENT SUMMARY	
B	CQC REPORT FORMS	

FIGURES

<u>NUMBER</u>		<u>PAGE</u>
2-1	Construction QA Organization Remedial Action	2-2

TABLES

<u>NUMBER</u>		<u>PAGE</u>
4-1	Construction Quality Assurance Plan - Submittal List	4-26



1.0 PROJECT DESCRIPTION AND SCOPE OF WORK

1.1 Introduction

This Construction Quality Assurance Plan (CQAP) has been developed to control all construction related activities performed for the implementation of the Remedial Action of the Enviro-Chem Superfund Site.

The activities to be performed during this portion of the Remedial Action construction phase are as follows:

- Install Compliance Monitoring Well Network
- Abandoned Existing Monitoring Wells
- General site grading and excavation
- Place excavation backfill soils
- Install 60-mil HDPE liner
- Place Stage 1 cover soils
- Place Stage 2 cover soils and geocomposite drainage
- Place 12-inch vegetative soil layer

1.2 CQAP Objectives

This document is one of the remedial design plans required by Exhibit A to the Consent Decree. This CQAP is intended to organize testing methods appropriate to construction including, at a minimum, testing of the Remedial Action construction materials prior to use, and testing of constructed remedial components to ensure that they meet the Contract Specifications.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITY

2.1 CQA/CQC Management Organization

Figure 2-1 presents a project organization chart which identifies the areas of responsibility and lines of authority for the Remedial Action construction activities. The QA/QC interactions between the ECC Trust's Engineer (Engineer), the Remedial Design Engineers, and the Remedial Contractor are described.

2.2 Responsibilities

Responsibilities of project personnel are described below.

2.2.1 Remedial Contractor's Project Manager

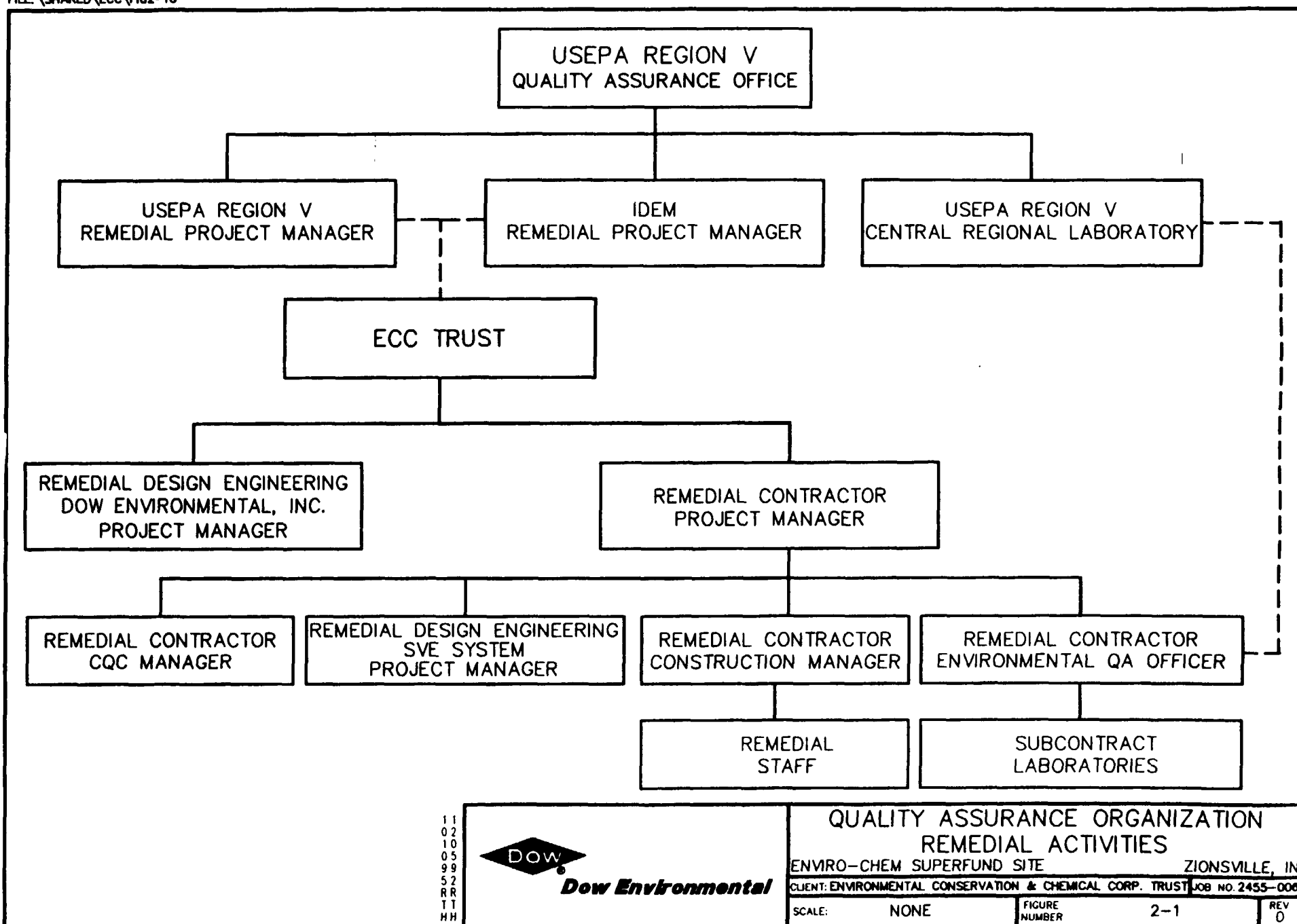
The Remedial Contractor's Project Manager shall have the primary responsibility for implementation of the project work in accordance with the project design, plans, and specifications. The Project Manager shall also provide the necessary communications interface with the following personnel:

- Engineer
- Remedial Design Project Managers

The Remedial Contractor's Project Manager, in the performance of his duties, may require a staff of technical and administrative people that will report directly to him. The technical staff will provide the day-to-day technical backup as it relates to the construction activities.

The administrative staff is necessary to perform day-to-day administrative functions. These administrative functions include such activities as:

- Tracking costs, invoices, billing
- Filing
- Organization and filing of the documentation



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Dow Environmental

QUALITY ASSURANCE ORGANIZATION REMEDIAL ACTIVITIES

ENVIRO-CHEM SUPERFUND SITE

ZIONSVILLE, IN

CLIENT: ENVIRONMENTAL CONSERVATION & CHEMICAL CORP. TRUST

JOB NO. 2455-008

SCALE: NONE

FIGURE
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The Project Manager will report directly to the Engineer and will directly supervise the Construction Manager.

2.2.2 Design Engineering Project Managers

Design Engineering for the Remedial Action will be performed in two stages. The first stage involves the design of the final cover and compliance monitoring systems and preparation of a SVE system performance specification. This design stage is presently being undertaken by Dow Environmental Inc. The second stage involves detailed design of the SVE system. This design will be performed by the Remedial Contractor and will require approval by the Engineer and the U.S. EPA prior to construction. Each design stage will have a Project Manager.

The Design Engineering Project Managers have the responsibility to provide a design which is capable of fulfilling the construction efforts as set forth in the Remedial Action Plan. Unexpected site conditions or changes in construction methodology could occur requiring design changes, therefore, the Design Engineering Project Managers may be active participants in progression of the project construction.

The Design Engineering Project Management staffs will either be part of the Project Manager's technical staff or will be a consulting engineer. They will support the Project Managers in the decision-making process for any required design changes. Any such changes will be fully documented. The Design Engineering Managers will either report to the Engineer or the Remedial Contractor's Project Manager, depending on whether they are in the role of consulting engineer or Remedial Contractor design staff, respectively.

2.2.3 Construction Manager

The Construction Manager is employed by the Remedial Contractor and has the responsibility to construct the remedial components in strict accordance with the plans and specifications, using the necessary manpower, construction procedures, and techniques. The Construction Manager shall retain the responsibility and authority to direct and manage his employees and the equipment used in constructing the remedial components. The Construction Manager reports to the Remedial Contractor Project Manager. Reporting responsibilities of the Construction Manager are outlined as follows:

- Prepare the Daily Report (Section 4.5.2)
- Maintain Submittals Register (Section 4.5.3)
- Prepare Report of Field Change (Section 4.5.6)
- Prepare Photographic Reporting Data Sheets (Section 4.5.7)
- Prepare Progress Reports (Section 6.1.1)

2.2.4 CQC Manager

The Remedial Contractor's CQC Manager and assigned staff shall function independent of the Remedial Contractor Construction Manager and the Engineer. The responsibility of the CQC Manager is to perform those activities specified in the CQAP which includes monitoring conformance to the plans and specifications by performing the necessary reviews, inspections, testing, and documentation.

The CQC Manager is responsible for overall management of the CQC system and has the authority to act independently in all quality control matters. The CQC Manager reports directly to the Remedial Contractor Project Manager for quality control purposes only. Responsibilities of the CQC Manager are outlined as follows:

- Manage the performance of all onsite and offsite inspections and testing.
- Review of the plans and specification for clarity and completeness.
- Schedule and coordinate inspection activities.
- Direct and support personnel in performing observations and tests.
- Evaluate the results of the inspections and testing.
- Notify the Project Manager of acceptance or rejection of the work and prepare the Non-compliance Notices as necessary (Section 4.5.5).
- Manage documentation of all inspections and testing, and notifications to the Site Construction and Project Managers through Daily Quality Control Reports.
- Prepare Final Certification of Completion Report (Section 6.1.2).

2.3 Personnel Qualifications

2.3.1 General

Personnel assigned to this project will have the necessary training, education, qualifications, and experience required to perform their specific duties. The required qualifications of key personnel is described in the following paragraphs.

2.3.2 Remedial Contractor's Project Manager

The Project Manager will possess a Bachelor of Science in engineering, or equivalent, having experience in construction supervision and be familiar with quality control and quality assurance aspects in construction and be familiar with landfill/compliant cover protocols. The Project Manager will possess good managerial and communications skills.

2.3.3 Design Engineering Managers

The Design Engineering Managers shall be Registered Professional Engineers with an appropriate engineering background. They should be experienced in those aspects related to either design and construction of final cover systems or SVE system, depending on their respective roles.

2.3.4 Remedial Contractor's Construction Manager

The Remedial Contractor's Construction Manager shall have demonstrated experience in construction and possess demonstrated knowledge of U.S. EPA/IDEM soil and geosynthetic installation techniques and related ASTM testing methods, and construction of mechanical systems related to SVE system.

2.3.5 Inspection (QC) Staff

The Remedial Contractor's Inspection Staff will possess adequate formal training and sufficient practical technical and administrative experience and certification by NICET to execute and record inspection activities successfully.

2.3.6 ECC Trust's Engineer

The ECC Trust's Engineer (Engineer) will be the direct representative of the Environmental Conservation and Chemical Corporation Trust (ECC Trust) and will be responsible for coordinating approval of all major field and design changes (Section 5.1) and communications between the Remedial Contractor and the ECC Trust.

The Engineer may also provide, at the discretion of the ECC Trust, construction oversight during the Remedial Action. In this role, the Engineer will provide construction activity reports in the form of progress reports and other notification to the ECC Trust.

3.0 QUALITY ASSURANCE OBJECTIVES

Quality assurance for the construction of the Remedial Action components will be maintained by planned and systematic actions which will ensure that the components conform with the project requirements and will perform satisfactorily.

The objectives of this CQAP are:

- To establish quality assurance guidelines for the final cover and compliance monitoring well construction.
- To maintain quality control through standardized procedures, documentation, inspections, and reporting.
- To establish the types of inspection, testing, and sampling activities and to provide required frequency.
- To assure inspection and sampling are carried out in accordance with established quality control procedures.
- To ensure that appropriate sampling and testing procedures are followed as outlined in Appendix A.

The quality assurance required for the construction will be achieved by applying field observations and material certifications supplemented by testing standards as set forth by the American Society for Testing and Materials (ASTM).

The specific procedures to be followed to achieve the quality assurance objectives for each element of work are described in the appropriate sections of this CQAP.

4.0 CONSTRUCTION COMPONENT EXAMINATION, MEASUREMENT, AND TESTING

The adequacy of workmanship during Remedial Action construction will be determined by visual examination, measurements, certifications, and testing. The extent to which each of these procedures will be employed is provided in Appendix A. The relative amounts of each type of inspection will vary as the work progresses. During the initial construction stages, the judgement of the Contractor CQC staff should be confirmed at frequent intervals by tests and measurements until their ability at determining adequacy by visual means is established. In some cases the amount of measuring and testing can be reduced as the work progresses, but it will not be eliminated.

Each type of inspection determines whether requirements of the plans and specifications are being met.

The CQC Manager has the authority to reject any workmanship or construction which does not meet the intent or the requirements of the plans and specifications.

4.1 Materials Inspection and Certifications

Materials used to construct the final cover and monitoring well systems components will be tested by, or at the direction of, the CQC Manager. The testing will occur before or during construction to assure compliance with the material specifications. All testing will be performed in accordance with the methods discussed in this section and summarized in Appendix A.

Manufactured items, particularly the final cover geomembrane and geotextile require manufacturer's certification verifying that those items meet the requirements of the specifications. The CQC Manager will review the data provided and visually inspect the item to assure compliance. The CQC Manager has the authority to reject the item, require additional information in keeping with the limits of the specifications, or conduct additional inspection as may be required.

Should the testing and/or certification establish that the material, item, or workmanship is not in accordance or does not meet the requirements of the plan or specifications, the following actions will be required.

- Manufactured Items - Any manufactured item which does not meet the requirements or intent of the plans or specifications will be rejected and not used in the construction.
- Construction Materials - Any materials which do not meet the requirements or intent of the plans or specifications will be rejected and not used in the construction.
- Workmanship - Any workmanship which does not meet the requirements or intent of the plans or specifications, or acceptable construction practice will be repaired, redone, or removed.

4.2 Measurements

4.2.1 General

The selection of sampling locations will be at the discretion and judgement of the CQC Manager.

The intent of the inspection and sampling strategies is to evenly distribute sample and in-situ test locations throughout the construction unit to provide a representative measurement of as-built quality. The particular location of any one sample or inspection will be left to the discretion of the CQC Manager. Areas not meeting design specifications shall be rejected.

4.3 Cover and Backfill Materials Testing and Construction Monitoring

4.3.1 Materials Testing

4.3.1.1 Soils

1. For each type of soil locate supply sources and obtain representative samples for laboratory analysis to confirm their quality and suitability.
2. Determine the quality and suitability of soils proposed for use in the final cover system by conducting the following material quality evaluation tests on each type of material:
 - a) Fill for general grading (suitable material)
 1. Standard Proctor (ASTM D698) one per 5,000 cubic yards or each change in material type.
 - b) Soil Cover (select material)
 1. Standard Proctor (ASTM D698) one per 5,000 cubic yards or each change in material type.
 2. Sieve analysis (ASTM D422) one per 5,000 cubic yards or each change in material type.
 3. Moisture content (ASTM D2216) one per 2,000 cubic yards or each change in material type.
 4. Atterberg Limits (ASTM D4318) one per 5,000 cubic yards or each change in material type.
 5. Hydraulic Conductivity (ASTM D2434), one per 2000 cubic yards or each change in material type.

c) Fine Aggregate Subbase

1. Sieve analysis (ASTM D422) one per 2,000 cubic yards.

d) Select Material Backfill (Southern Concrete Pad)

1. Standard Proctor (ASTM D698) one per 5,000 cubic yards or each change in material type.
2. Sieve analysis (ASTM D422) one per 5,000 cubic yards or each change in material type.
3. Moisture content (ASTM D2216) one per 2,000 cubic yards or each change in material type.
4. Atterberg Limits (ASTM D4318) one per 5,000 cubic yards or each change in material type.

e) Vegetative Layer

1. Soils classification (ASTM D2487) one per 5,000 cubic yards or each change in material type.

4.3.1.2 Geosynthetics

HDPE Liner

The manufacturer shall provide the CQC Manager a quality control certificate for each roll of geomembrane prior to shipment. The certificate will list the roll numbers and identification, sampling procedures, and test results.

Conformance Testing

Upon arrival at the Site, the CQC Manager will sample the rolls of geomembrane. The sampling frequency shall be 1 sample per lot or 1 sample per 100,000 square feet, whichever

is less. Samples shall be taken across the entire width of the roll but not within the first 3 feet of the roll. Samples shall be tested for the following properties:

- Density (ASTM D1248)
- Carbon Black Content (ASTM D1603)
- Carbon Black Dispersion (ASTM D2669)
- Thickness (ASTM D751)
- Tensile Characteristics (ASTM D638)
- Melt Flow Index (ASTM D1238)

Geotextiles

The geotextile manufacturer shall provide a letter of certification indicating the provided geotextiles meet the minimum average roll values for the specified material. Each roll shall be labeled by the manufacturer with the following:

- Manufacturer's name
- Product identification
- Unique roll and lot number
- Roll dimensions
- Any special handling requirements

Conformance Testing

Upon arrival at the Site, the CQC Manager will sample the rolls of geotextile. The sampling frequency shall be 1 sample per lot or 1 sample per 100,000 square feet, whichever is less. Sampling locations vary by test but not within the first 3 feet of the roll. The size of the sample shall be 3 feet by width of roll. Samples shall be tested for the following properties:

- Mass per unit area (ASTM D3776)
- Permittivity (ASTM D4491)
- Apparent opening size (ASTM D4751)
- Grab strength (ASTM D4632)
- Trapezoidal tear strength (ASTM D4533)

- Puncture strength (ASTM D4833)
- Thickness (ASTM D1777)
- Burst strength (ASTM D3786)

4.3.2 Construction Monitoring

4.3.2.1 Soils Placement

1. The following construction quality evaluation tests shall be performed on each type of soil material.
 - a) Fill for General Grading (suitable material)
 1. Nuclear density meter (ASTM D2922) 5 per acre per lift. Questions concerning the accuracy of a single test shall be addressed by retesting at that or another suitable location. The accuracy of the nuclear testing equipment shall be verified by utilizing a sand cone (ASTM D1556) for a minimum of 1 per every 20 ASTM D2922 tests.
 2. Moisture content (ASTM D3017) 5 per acre per lift. Questions concerning the accuracy of a single test shall be addressed by retesting at that or another suitable location. The accuracy of the nuclear testing equipment shall be verified by utilizing moisture content (ASTM D2216) for a minimum of 1 per every 10 ASTM D3017 tests.
 3. Continuous visual observation and inspection shall be performed. Special attention shall be given to the condition of the placement surface; water content, density, and other pertinent physical properties of the compacted soil; loose and compacted lift thicknesses and elevations; lift scarification and bonding procedures; effects of the compaction equipment on the lift surface; the number of equipment passes required to compact each lift; and desiccation cracking of the lift caused by drying.

b) Soil Cover (select material)

1. Nuclear density meter (ASTM D2922) 5 per acre per lift. Questions concerning the accuracy of a single test shall be addressed by retesting at that or another suitable location. The accuracy of the nuclear testing equipment shall be verified by utilizing sand cone (ASTM D1556) for a minimum of 1 per every 20 ASTM D2922 tests.
2. Moisture content (ASTM D3017) 5 per acre per lift. Questions concerning the accuracy of a single test shall be addressed by retesting at that or another suitable location. The accuracy of the nuclear testing equipment shall be verified by utilizing moisture content (ASTM D2216) for a minimum of 1 per every 10 ASTM D3017 tests.
3. Continuous visual observation and inspection shall be performed. Special attention shall be given to the condition of the placement surface; water content, density, and other pertinent physical properties of the compacted soil; loose and compacted lift thicknesses and elevations; lift scarification and bonding procedures; effects of the compaction equipment on the lift surface; the number of equipment passes required to compact each lift; and desiccation cracking of the lift caused by drying.

c) Fine Aggregate Subbase

1. The wastewater storage tank subbase fine aggregate shall have continuous visual inspection while being spread before being compacted by dry vibratory rolling. Lift depth checks on placed material will be conducted for a minimum of 5 per acre.

d) Select Material Backfill (Southern Concrete Pad)

1. Nuclear density meter (ASTM D2922) 5 per acre per lift. Questions concerning the accuracy of a single test shall be addressed by retesting at that or another suitable location. The accuracy of the nuclear testing equipment shall be verified by utilizing sand cone ASTM D1556 for a minimum of 1 per every 20 ASTM D2922 tests.
2. Moisture content (ASTM D3017) 5 per acre per lift. Questions concerning the accuracy of a single test shall be addressed by retesting at that or another suitable location. The accuracy of the nuclear testing equipment shall be verified by utilizing moisture content (ASTM D2216) for a minimum of 1 per every 10 ASTM D3017 tests.
3. Continuous visual observation and inspection shall be performed. Special attention shall be given to the condition of the placement surface; water content, density, and other pertinent physical properties of the compacted soil; loose and compacted lift thicknesses and elevations; lift scarification and bonding procedures; effects of the compaction equipment on the lift surface; the number of equipment passes required to compact each lift, and desiccation cracking of the lift caused by drying.

e) Topsoil for vegetation layer

1. Top soil layer shall be continuously visually inspected while being spread. A minimum of five lift depth checks will be made per acre.

f) Field Surveys

1. Field surveys shall be performed to assure proper lift and total layer thicknesses, and construction at the proper locations and elevations. Survey data shall be collected at points a maximum of 50 feet apart or a minimum of six points per lift and at any critical location and will meet a maximum tolerance of ± 0.20 feet horizontally and vertically.

4.3.2.2 Geosynthetic Installation

HDPE Liner

- A. Personnel performing seaming operations shall be qualified by experience or by successfully passing seaming tests. At least one seamer shall have experience seaming a minimum of 1,000,000 ft² of HDPE geomembrane using the same type of seaming equipment that is used at the Site.
- B. Contractor will provide the Engineer with a list of proposed seaming personnel and their professional records. Proposed personnel deemed sufficiently inexperienced shall not be accepted by the Engineer.
- C. Test seams shall be made on pieces of geomembrane liner to verify that seaming conditions are adequate. Test seams shall be made at the beginning of each seaming period and at least once each 4 manhours for each seaming apparatus used that day. Each seamer shall make at least one test seam each day.
- D. Test seam samples shall be at least 2 feet long and 1 foot wide with the seam centered lengthwise. Two adjoining specimens 1 inch wide shall be cut from the test seam sample. These specimens shall be tested in the field in shear and peel, respectively, by hand or tensiometer, and shall not fail in the seam. If a test seam fails, the entire operation shall be repeated. If the additional test seam fails, the seaming apparatus or seamer shall not be accepted or be used for seaming until two consecutive successful test seams are achieved.
- E. Contractor will nondestructively test all field seams over their full length using a vacuum test unit or air pressure (fusion process). Testing shall be done as the work progresses and not at the completion of all field seaming.
- F. Locations where seams cannot be nondestructively tested shall be observed by CQC Manager for uniformity and completeness.

G. Vacuum testing procedures and requirements consist of the following:

- 1. Vacuum testing shall be conducted by utilizing a steel box with a clear-view glass top, a rubber gasket on the open bottom perimeter, a pressure gauge on the inside, and a vacuum hose connection to a steel vacuum tank and pump assembly equipped with a rubber pressure/vacuum hose with fittings and connections.**
- 2. The box shall be placed over a seam section that has been thoroughly saturated with a soapy water solution. The rubber gasket on the bottom perimeter of the box must fit snugly against the soaped seam section of the liner.**
- 3. When 3 to 5 inches of vacuum is achieved, the seam shall be inspected for pinholes, porosity, or nonbonded areas. Test time shall be a minimum of 30 second per test section.**
- 4. If a void is detected, it shall be properly marked for subsequent repairs.**

H. Air pressure testing procedures and requirements are as follows:

- 1. An air pump must be equipped with a pressure gauge capable of generating and sustaining 25 to 30 psi pressure, a hose, fittings and connections, and a sharp needle or approved alternate device.**
- 2. Seams must be sealed. The needle shall be inserted in the cavity created by the fusion weld, apply 25 to 30 psi pressure for 5 minutes.**
- 3. The seam must be inspected for defects, pinholes, porosity, and nonbonded areas.**
- 4. If a void is detected, it shall be marked and repaired.**

I. Destructive seam testing shall be performed as follows:

1. Location and Frequency

- a) No less than an average of one test must be conducted per 500 feet of seam length or per day whichever is greater.
- b) Additional test locations shall be determined during seaming at the CQC Managers discretion. Selection of such locations may be prompted by suspicion of excess crystallinity, contamination, offset welds, or any other potential cause of imperfect welding.
- c) Contractor will not be informed in advance of the locations where the seam samples will be taken.

2. Sampling Procedures

- a) Samples shall be cut at locations designated by and under the observation of the CQC Manager in order to obtain laboratory tests results prior to completion of liner installation. Each sample shall be numbered and the sample number and location identified on the panel layout drawing.
- b) Holes in the geomembrane resulting from destructive seam sampling shall be immediately repaired. The new seams in the repaired area shall be nondestructively tested.

3. Size of Samples

- a) Samples shall be 12 inches wide by 38 inches long with the seam centered lengthwise. One 1-inch wide strip shall be cut from each end of the sample, and these strips shall be tested in the field, by hand or tensiometer, for shear and peel, respectively and shall not fail in the seam. The remaining sample shall be cut into three equal parts (minimum 12 inches each) and distributed as follows:

- b) One portion for the Contractor's independent laboratory testing (12 inches by 12 inches).
 - c) One portion for the CQC Manager's independent laboratory testing (12 inches by 12 inches), and
 - d) One portion for the CQC Manager for archive storage (12 inches by 12 inches).
- 4. Contractor's Laboratory Testing: Test results from the Contractor's independent laboratory shall be submitted to the Engineer as soon as they become available.
- 5. Procedures for Destructive Test Failure: The following procedures shall apply whenever a sample fails the field destructive test or the laboratory test (Contractor's independent or CQC Manager's independent laboratory).
 - a) Contractor will reconstruct the seam between the failed location and any passed test locations.
 - b) Contractor will retrace the welding path to an intermediate location (at a 20-foot minimum from location of a failed test) and take a small sample for an additional field test. If this additional sample passes the test, the seam shall be reconstructed between that location and original failed location. If this sample fails, the process shall be repeated.
 - c) In any case, all acceptable seams shall be bounded by two passed test locations in both directions and one sample for destructive testing shall be taken within the reconstructed area.
 - d) Whenever a sample fails, additional testing may be required for seams that were welded by the same welder and welding apparatus or welding during the same time shift.

Geotextiles

The CQC personnel shall ensure that the geotextile separate sheets are indeed sewn together with a minimum of 4-inch overlap. The personnel shall lightly tug on the seams at various locations to verify that all seams have indeed been sewn, and the stitch is at least as strong to the pull as the fabric itself. The personnel shall notify the CQC Manager of any problems.

All holes or tears in the geotextile shall be repaired by patching with the same geotextile. The patch shall be a minimum of 12 inches larger in all directions than the area to be repaired and shall be sewn into place. On slopes steeper than 20 percent, the patch may not be placed any closer than 1 inch (25 mm) from any edge. If a roll has a tear which exceeds 10 percent of the width of the roll, that portion of the roll shall be removed and replaced.

The CQC personnel shall observe all repairs and verify that each conforms with the above procedures. The personnel shall notify the CQC Manager and the Construction Manager of any problems or deviations from the specified procedures.

The cover material shall be placed in such a manner to assure that the geotextiles are not damaged. Care shall be taken to minimize any slippage of the geotextile and to assure that no tensile stress is induced in the materials.

4.3.3 Geocomposite Drainage Net

4.3.3.1 Manufacturers Documentation

Prior to delivery, the Geocomposite Drainage Net Manufacturer shall provide documentation which demonstrates that the material properties of the material meet design requirements. Delivered rolls of geocomposite drainage net shall be appropriately labeled.

Certification of Material Properties

Prior to the installation of any geocomposite, the Geocomposite Manufacturer or Installer shall provide the Project Manager with the following information:

- The origin (supplier's name and production plant) and identification (brand name and number) of the geotextile and HDPE drainage net used to fabricate the geocomposite.
- Copies of dated quality control certificates issued by the geotextile and HDPE drainage net supplier. These certificates shall contain the results of the quality control tests performed on the geocomposite components as outlined in this CQA Plan.

The Geocomposite Drainage Net Manufacturer shall provide the Project Manager with a list of guaranteed "minimum average roll value" properties (as defined by the Design Engineer) for the type of geocomposite drainage net to be supplied. The Geocomposite Drainage Net Manufacturer shall provide the Project Manager with a written certification signed by a responsible party that the geocomposite drainage net actually delivered has properties which meet or exceed the guaranteed "minimum average roll values" properties.

The CQA Officer shall examine the Manufacturer's certifications to verify that the property values listed on the certifications meet or exceed the Manufacturer's guaranteed minimum values and the design specifications. Deviations shall be reported to the Project Manager.

Labeling

The Geocomposite Drainage Net Manufacturer shall identify all rolls of geocomposite drainage net. Each roll shall have a weatherproof label which contains the following:

- **Manufacturer's name**
- **Product identification**
- **Roll dimensions**

In addition, if any special handling of the geocomposite drainage net is required, it shall be so marked on the top surface of the geotextile, e.g., "This Side Up".

The CQA Officer shall examine rolls upon delivery and any deviation from the above requirements shall be reported to the Project Manager.

4.3.4 Shipment and Storage

During shipment and storage, the geocomposite drainage net shall be protected from ultraviolet light exposure, precipitation, snow or other inundation, mud, dirt, dust, puncture, cutting, or any other damaging or deleterious conditions. Rolls shall be wrapped in plastic sheets or otherwise protected. Wrappings protecting the rolls should be removed less than 1 hour prior to unrolling the geocomposite drainage net.

Geotextiles/geonet composites shall not be exposed to precipitation prior to being installed. Wet geotextiles/geonet composites are heavy which makes them difficult to deploy and can also effect liner welding when the geomembrane is adjacent to the geotextile. During cold weather, geotextiles/geonet composites must be protected from freezing.

The CQA Officer shall observe rolls upon delivery and prior to installation, any deviation from the above requirements shall be reported to the Project Manager. Any damaged rolls shall be rejected and replaced at no cost to the Owner.

4.3.5 Conformance Testing of Geocomposite Drainage Nets

Prior to the deployment of the rolls, the CQA Officer shall remove and forward samples to the Geosynthetics CQA Laboratory for testing to verify conformance with the test methods and values presented in Table 6-1 (Attachment A).

4.3.5.1 Sample Collection

Using the packing list provided by Manufacturer or a sequential inventory list made by the CQA Officer, rolls shall be selected for sampling at a minimum frequency of 1 sample per 100,000 square feet (9,000 m²) of material. If the material is shipped in identifiable lots or manufacturing runs, sample selection should be adjusted to assure that the minimum frequency

is met and that each different lot or manufacturing run is represented by at least one sample. If a roll is not identifiable by roll number, the CQA Officer shall inform the Project Manager immediately. If the roll cannot be tracked, the Project Manager shall reject the roll.

Samples will be taken across the entire width of the roll and will not include the first 3 lineal feet (1 m). Unless otherwise specified, samples will be 3 feet (1 m) long by the roll width. The CQA Officer will mark the machine direction on the samples with an arrow.

4.3.5.2 Test Results

The results of the conformance testing shall be evaluated in accordance to the following procedure:

- If the average test values for the sample meet all of the values given in the design specifications and the Manufacturer's guaranteed minimum values, the sample passes.
- If the average test value for the sample does not meet one or more of the required values, additional evaluation procedures will be implemented by the CQA Officer. Additional tests required for further evaluation shall be done at no expense to the Owner.
 - For the failing parameter(s), perform two additional tests on the sample. These tests may be performed by another Geosynthetics CQA Laboratory at the discretion of the CQA Officer and the Project Manager.
 - If the average test values for each of the two additional tests meet the required values, the roll and adjacent rolls pass and are acceptable.
 - If one or more of the average test values do not meet requirements, reject the roll, collect samples from the closest numerical roll on both sides of the failed roll and test for the failed parameter(s). If one or both of these tests do not meet requirements that (those) roll(s) will be rejected and the CQA Officer and Project Manager shall determine further testing protocol and criteria for identifying the limits of rejected rolls.

4.3.6 Handling and Placement

The Installer shall handle geotextiles/geonet composites in such a manner as to minimize damage and shall comply with the following:

- On slopes, the geocomposite shall be securely anchored and then rolled down the slope in such a manner as to continually keep the geocomposite sheet in tension. If necessary, the geocomposite shall be positioned by hand after being unrolled to minimize wrinkles.
- In the presence of wind, all geocomposites shall be weighted with sandbags filled with fine grained material or the equivalent. Sandbags shall be installed during deployment and shall remain until replaced with cover material.
- Unless otherwise specified, single-sided geocomposite shall not be welded to the geomembrane.
- Geocomposites shall be cut using a hook blade or other tool approved by the Project Manager. If in place, special care shall be taken to protect underlying geosynthetics from damage which could be caused by the cutting of the geocomposite. Care shall be taken not to leave the tools in the geocomposite.
- The Installer shall take any necessary precautions to prevent damage to underlying layers during placement of the geocomposite.
- During placement of geocomposite, care shall be taken not to entrap in or beneath the geocomposite, stones, or dirt that could damage the geomembrane, cause clogging of drains or filters, or hamper subsequent seaming.
- A visual examination of the geotextile component of the geocomposite shall be carried out over the entire surface, after installation, to ensure that no potentially harmful foreign objects are present.

The CQA Officer shall note any noncompliance and report it to the Project Manager.

4.3.7 Seams and Overlaps

In general, no horizontal seams shall be allowed on sideslopes thus seams shall be along, not across, the slope, except as part of a patch. If horizontal seams are required, offset adjacent horizontal seams.

At a minimum, the following requirements shall be met:

- Adjacent geocomposite shall be overlapped so that the HDPE drainage net overlaps by at least 6 inches (150 mm) and the geotextile of the geocomposite overlap by at least 3 inches (75 mm).
- The HDPE drainage net of the geocomposite will have overlaps shall be tied with plastic fasteners. Tying devices shall be white or yellow for easy inspection. Metallic devices are not allowed. If self-locking plastic tie wraps are used, the locking joint shall be set within the rib to prevent damage to adjacent materials.
- Tying shall be every 5 feet (1.5 m) along the slope, every 6 inches (150 mm) in the anchor trench, and every 6 inches (150 mm) along end-to-end seams on the base of the landfill.
- In the corners of the sideslopes where overlaps between perpendicular strips are required, an extra layer shall be unrolled along the slope, on top of the previously installed geocomposite, from top to bottom of the slope.
- When more than one layer of geocomposite is installed, joints shall be staggered.
- Once HDPE drainage net is tied, the geotextile of the geocomposite shall be seamed. The Installer shall pay particular attention to seams to ensure that no earth cover material could be inadvertently inserted beneath the geotextile if applicable.
- Any sewing shall be done using polymeric thread with physical, chemical, and ultraviolet light resistance properties equal to or exceeding those of the geotextile. Sewing shall be done using machinery and stitch types specified in the project

specifications or as approved in writing by the Project Manager and the CQA Officer.

The CQA Officer shall note any deviation and report it to the Project Manager.

4.3.8 Repair Procedures

The final decision as to the appropriate repair shall be agreed upon between the Project Manager, Installer, and CQA Officer. Prior to acceptance of the geocomposite, the Installer shall locate and repair all damaged areas as directed by the CQA Officer. Care shall be taken to remove any soil or other material which may have penetrated the torn geotextile. The CQA Officer shall observe any repair and report any noncompliance with the following requirements in writing to the Project Manager.

If in the CQA Officer's judgement, the defect is determined to be small, typically smaller than 3 feet x 3 feet (1 m x 1 m), the geocomposite shall be repaired as follows:

- If the HDPE drainage net is judged to be undamaged but the geotextile is damaged, a patch of geotextile shall be placed. The geotextile patch shall be sewn in place with a minimum of 24 inch (0.6 m) overlap in all directions.
- If the HDPE drainage net is judged to be damaged, the damaged HDPE drainage net shall be removed. A section of HDPE drainage net shall be cut to replace the removed section. The HDPE drainage net shall be tied to the existing HDPE drainage net using white plastic fasteners placed at least every 6 inches (150 mm) overlap. A geotextile patch shall be placed over the repaired HDPE drainage net section. The geotextile patch shall be thermally bonded in place with a minimum of 12 inch (0.3 m) overlap in all directions.

If the hole or tear width across the roll is more than 50 percent of the width of the roll, the damaged area shall be cut and the two portions of the geocomposite drainage net shall be joined as indicated in Section 6.5.

The CQA Officer shall observe any repair, note any deviation with the above requirements, and report them to the Project Manager.

4.3.9 Placement of Materials on Geocomposite Drainage Nets

The Installer shall place materials on the geocomposite drainage net in the following manner:

- Cause no damage to the geocomposite drainage net and underlying geosynthetics.
- Allow minimal slippage of the geocomposite drainage net on underlying layers.
- No excessive stresses in the geocomposite drainage net.
- Equipment used for placing the overlying material shall not be driven directly on the geocomposite drainage net.
- A minimum thickness of 1 foot (30 cm) of soil must be maintained between a light, low ground pressure equipment (such as a wide pad Caterpillar D-6 or lighter) and the geocomposite drainage net.
- A minimum thickness of 1.5 feet (45 cm) of soil must be maintained between rubber-tired vehicles and the geotextile unless approved by the Design Engineer and Project Manager.
- In heavily trafficked areas such as access ramps, soil thickness shall be at least 3 feet (1 m).

Any deviation shall be noted by the CQA Officer and reported to the Project Manager.

4.3.10 Erosion Control Revetments

The Fabrications Manufacturer shall provide materials certification that the properties of the material meet manufacturer's specification.

The fabric forms manufacturer shall provide the Project Manager with a list of guaranteed minimum properties (as defined by the Technical Specifications). The fabric from manufacturer shall provide the Project Manager with written certification signed by a responsible party that

the fabric forms actually delivered has properties which meet or exceed the guaranteed properties.

The CQA Officer shall examine the manufacturer's certification to verify that the material properties listed on the certifications meet or exceed the manufacturer's guaranteed minimum values and the design specifications. Deviations shall be reported to the Project Manager.

4.3.10.1 Shipment and Storage

During shipment and storage, the fabric forms shall be protected from ultraviolet light, precipitation, snow, mud, dirt, dust, puncture, cutting, or any other damaging or deteriorious conditions.

The CQC Officer shall observe rolls upon delivery and prior to installation, any deviations from the above requirements shall be reported to the Project Manager. Any damaged mats shall be rejected and repaired at no cost to the Owner.

4.3.10.2 Handling; Placement and Installation

The installer shall handle the Fabriform Filter Revetment panels in such a manner as to minimize damage and shall comply with the following:

- The contractor shall handle the Fabriform mats in such a manner as to ensure they are not damaged.
- In the presence of wind, all Fabriform mats shall be sufficiently secured to prevent their movement prior to filling.
- During placement, care shall be taken not to entrap stones or moisture under the fabriform. Care shall be taken not to walk on or drag equipment across the fabriform during filling operations.
- Prior to final aggregate concrete injection, the fabriform shall be positioned over a geotextile filter fabric as specified by the Engineer, Technical Specifications.

Care should be taken to allow appropriate allowance for contraction of the fabric which will occur as a result of final aggregate concrete injection.

- Fabric mats may be factory assembled in predetermined sizes and joined together side-by-side at the job site by field screening or by means of zipper closures attached to the upper and lower layers of fabric. If joining of mats, as described above, is impractical, adjacent mats may be overlapped a minimum of two feet, subject to Engineer's approval. In no case will simple butt joints between mats be allowed.

4.3.10.3 Slope Preparation

The surfaces to be protected shall be prepared and graded as specified by the Engineer, revetments should be placed over relatively smooth surfaces. Anchor and trenching will be in accordance with project work plans and specifications.

4.3.10.4 Final Aggregate Concrete Injection

Following placement of the Fabriform mats over the geotextile filter, a final aggregate concrete (see Engineer's Specifications) shall be injected between the top and bottom layers of fabric through designated fill parts in the upper layer of fabric. The injection pipe shall be wrapped tightly at the point of injection with a strip of burlap during pumping.

The sequence of final aggregate concrete injection shall be such as to insure complete filling of the revetment fabric to the thickness specified by the manufacturer.

- During concrete injection, the mat thickness can be measured by inserting a short piece of stiff wire through the crowns of the mat midway between filter points at several locations from the crest to the toe of the slope. Any mat measuring less than 90 percent of the average of all thickness measurements shall be reinjected until average thickness has been attained.
- The upper portion of the fabric form which has been placed in the anchor trench shall be filled first, followed by concrete injections into the lower edge, work back up the slope. Care should be taken not to over pressure the fabriform mats.

Excessive final aggregate concrete which has been inadvertently spilled on the mat surface shall be removed as soon as practical. A broom and shovel may be used for this purpose. The use of water will be prohibited.

To prevent improper curing of final aggregate concrete, only the amount of fabriform mats that can be anchored, inspected, repaired and protected in the same day shall be installed.

Continuous visual observation and inspection shall be performed by the CQC officer for uniformity and completeness during installation and filling process.

4.4 Monitoring Wells

4.4.1 Existing Monitoring Well Abandonment

Abandonment of the existing monitoring wells that are located within the area to be capped will be completed by the following procedures:

1. Measure depth of well; make certain there are no obstructions in the borehole.
2. Excavate 1-foot deep hole around each well. Remove concrete seal around upper foot of casing and cut off exposed upper foot of casing.
3. Tremie a mixture of neat cement and bentonite into the borehole, beginning at the base of each borehole. The grout mixture should be prepared as follows: one sack portland cement, 7 gallons of water, and 5 pounds of bentonite powder.
4. Tremie grout to top of cut-off casing.
5. Place a 6-inch bentonite pellet seal on top of borehole, fill entire dug hole surface area.
6. Finish remaining space in dug hole with grout mixture with sloped sides from the center of the borehole.
7. Document all abandonment procedures.

Continuous visual observation and inspection shall be performed by the remedial contractor's registered hydrogeologist during well abandonment procedures. The cement bentonite mixture will comply with specifications for well seals in Section 56.000 of the U.S. EPA Manual of Water Well Construction Practices. The cement bentonite mixture will be injected at a pressure of at least 50 psi greater than the normal hydrostatic pressure of the water column at the base of each well. Tremie grouting will continue until enough grout has been introduced to account for the volume of the well casing, the annular space around the casing, and a minimum of 10 additional lineal feet of casing. A summary report will be issued detailing the results of the well abandonment procedures.

4.4.2 Compliance Monitoring Well Construction

4.4.2.1 Confirmatory Test Borings

One exploratory test boring will be advanced at each of the proposed compliance monitoring well locations. A registered site hydrogeologist from the remedial contractor will be present to visually observe and classify the lithology at each location. The depth to the top of the sand and gravel unit and the thickness of that unit will be determined at each location through continuous split spoon sampling. The final design of the compliance monitoring wells will be based on the results of the exploratory test borings. The FSP details the general design requirements for each type of well.

The site hydrogeologist will prepare a report summarizing the results of the exploratory test borings and will determine the final design specifications including the screen lengths and elevation of the screened interval of each well from the test borings. These specifications will be incorporated into the Final Remedial Design specifications upon completion by the Remedial Design Engineer.

4.4.2.2 Construction of Compliance Monitoring Wells

The compliance monitoring wells will be constructed from the final design specifications derived from the exploratory test borings. The remedial contractor will provide the specialized drilling services and a registered hydrogeologist to install the wells. The registered hydrogeologist will provide continuous oversight and documentation of the well construction and installation. Manufactured materials, such as well screen, well casing, will require manufacturers certification

verifying that those materials meet the requirements of the final design specifications. The registered hydrogeologist will be responsible for onsite measurement and placement of the well materials according to the final design specifications.

4.5 Quality Assurance Documentation

4.5.1 General

The CQAP will not be effective unless all critical construction activities that should be inspected are designated and personnel are assigned to each inspection task by the CQC Manager. This is accomplished by using standardized documentation forms covering the anticipated items that are to be inspected. The following reports and records will be prepared by the individuals indicated with distribution as noted. Appendix B provides the forms and logs required for documentation of the CQC activities. Table 4-1 summarizes the various submittals required by the CQAP.

4.5.2 Daily Report

A daily written summary report will be prepared by the Construction Manager. This report provides a chronological framework for identifying and recording all other reports and aids in tracking what was done and by whom. As a minimum, the daily summary reports will contain the following information:

- Unique identifying sheet number for cross referencing and document control.
- Date, project name, location, cell under construction, personnel involved in major activities and other relevant identification information.
- Description of weather conditions, including temperature, cloud cover, and precipitation.
- Summaries of any meetings held and actions recommended or taken.
- Specific work units and locations of construction underway during that particular day.

TABLE 4-1**CONSTRUCTION QUALITY ASSURANCE PLAN
SUBMITTAL LIST
PAGE 1 OF 2**

Submittal	Preparer of Submittal	Recipient of Submittal	Schedule of Submissions
Daily Report	Remedial Contractor's Construction Manager	Remedial Contractor's CQC and Project Managers, and Engineer	Daily
Submittals Register	Remedial Contractor's Construction Manager	Remedial Contractor's CQC and Project Managers, and Engineer	Weekly
Daily QC Reports	Remedial Contractor's CQC Manager	Engineer, Remedial Contractor's Project and Construction Managers.	Daily
Noncompliance Notification	Remedial Contractor's CQC Manager	Remedial Contractor's Project Managers, and Engineer.	Per occurrence
Report of Field Change	Remedial Contractor's Construction Manager	Engineer Remedial Contractors Construction QC (to filed original) and Project Manager, and Remedial Design Engineer's Project Manager	Per occurrence
Well Abandonment Summary Report	Remedial Contractor's Construction Manager	Remedial Contractor's Project Manager and CQC Manager Engineer	At completion of work
Final Design Specs for Compliance Monitoring Wells	Remedial Contractor's Register Hydrogeologist	Remedial Contractor's Construction, CQC and Project Managers, Engineer	At completion of work
Manufacturers and Suppliers Material Certification with CQC Transmittal Form	Remedial Contractor's CQC Manager	Engineer	Daily with first shipment of material
Corrective Actions Report	Remedial Contractor's Construction Manager	Engineer	As necessary

TABLE 4-1**CONSTRUCTION QUALITY ASSURANCE PLAN
SUBMITTAL LIST
PAGE 2 OF 2**

Submittal	Preparer of Submittal	Recipient of Submittal	Schedule of Submissions
Photographic Reporting Data Sheets	Remedial Contractor's Construction Manager	Engineer Remedial Contractor's Project Manager	At completion of work
Progress Reports	Remedial Contractor's Construction Manager	Remedial Contractor's Project Manager Engineer	Determined at pre-construction meeting
Final Certification of Completion	Remedial Contractor's CQC Manager	Engineer, ECC Trust, Design Engineer U.S. EPA, IDEM	At completion of work

- Equipment and personnel being utilized in each unit process, including subcontractors.
- Signature of Construction Manager.

All of the daily inspection data sheets will be numbered sequentially and attached to this report. The originals will be filed with the Engineer and copies sent to the CQC Manager, Project Manager. A permanent and complete record of this information will be kept at the project site.

4.5.3 Submittals Register

The Submittal Register provides a record of all submittals and transmittals related to materials and construction. Examples of items to be recorded include construction drawings, shop drawings, samples, certifications, and test data. The Construction Manager will maintain this register, numbered sequentially, and will send copies to the CQC Manager and the Project Manager.

4.5.4 Daily Quality Control Reports

Daily quality control reports shall be prepared to document the inspections and field tests for the principal operations incorporated in the construction of the Final Cover components. Appended to these reports will be recorded pertinent observations in the form of notes, charts, sketches, photographs, or any combination of these. The original (or copy) will be filed by the CQC Manager with copies sent to the Engineer and the Project and Construction Managers.

All observations, results of field tests, and results of laboratory tests performed onsite or offsite should be recorded on a suitable data sheet. Recorded observations may take the form of notes, charts, sketches, photographs, or any combination of these.

As a minimum, the inspection data sheets should include the following information:

- Unique identifying sheet number for cross referencing and document control.
- Description or title of the inspection activity.

- Location of the inspection activity or location from which the sample was obtained.
- Description of offsite material received, including any quality control data provided by the supplier.
- Calibrations, or recalibrations, of test equipment, including actions taken as a result of recalibration.
- Decisions made regarding approval of units of material or of work, and/or corrective actions to be taken in instances of substandard or suspect quality.
- Unique identifying sheet numbers of inspection data sheets and/or problem reporting and corrective measures used to substantiate any QA/QC decisions described in the previous item.
- Type of inspection activity and procedure used (reference to standard method when appropriate or specific method described in CQAP).
- Recorded observation or test data, with all necessary calculations.
- Results of the inspection activity (e.g., pass/fail); comparison with specification requirements.
- Personnel involved in the inspection besides the individual preparing the data sheet.
- Signature of the CQC Manager.

4.5.5 Non-Compliance Notifications

Non-compliance notifications will be prepared to document problems encountered and the corrective measures taken to alleviate the problem. The problems may relate to materials or workmanship that does not meet the plans and specifications. Notifications will be prepared as

necessary by the CQC Manager. The original shall be filed by the CQC Manager with copies sent to the Engineer and the Project Manager.

A problem is defined as material or workmanship that does not meet the requirements of the plans, specifications, or CQAP for a project or any obvious defect in material or workmanship, non-compliance notifications will contain the following information:

- Unique identifying sheet number for cross referencing and document control.
- Location of the problem.
- Description of the problem (in as much detail as possible and with supporting sketches or photographic information where appropriate).
- Probable cause.
- How and when the problem was located (reference to inspection data sheet or daily summary report by CQC Manager).
- Where relevant, estimation of how long the problem has existed.
- Any disagreement noted by the inspector between the inspector and contractor about whether or not a problem exists or the cause of the problem.
- Suggested corrective measure(s).
- Documentation of correction if corrective action was taken and completed prior to finalization of the problem.
- Where applicable, suggested methods to prevent similar problems.
- Signature of the CQC Manager.

4.5.6 Report of Field Change

A report indicating changes to the originally specified construction will be prepared by the Construction Manager which will describe, in detail, the recommended change or changes that are made. Indication will be made as to whether this is an isolated case or general condition which will affect or change additional work or future specifications and drawings. The original shall be filed with the CQC Manager with copies sent to the Project Manager, the appropriate Remedial Design Engineer Project Managers, and the Engineer.

4.5.7 Photographic Reporting Data Sheets

A pictorial record of the work progress, problems, and corrective measures will be handled through the Photograph Documentation Plan prepared by the Construction Manager for the final cover. Photographs will be identified as to the roll number, the frame number, the date, and the project, and will be geared toward Physical Component documentation. Videotaping will be identified as to the cassette number, counter position or time elapsed, the date, and the project, and will be geared toward construction activities. A description will be included of pertinent objects in the photograph identified and recorded. The negatives will be filed in the order taken and stored separately from the photographs. A data sheet, numbered sequentially, will be filed with the Engineer, at the completion of the work, with copies to the Project Manager. Two prints of photographs will be obtained, one set for the Engineer and the other set for the CQC Manager. Videotapes can be reproduced if required.

4.5.8 QC Transmittal Form

A standard QC transmittal form will be required when submitting any type of QC documentation. The transmittal form shall be used by all parties involved with the ECC Site construction QA.

4.5.9 Storage of Records

During the construction of the Cover System components, the CQC Manager will be responsible for all construction documents, including originals of reports and data sheets described in this section. Duplicates will be stored with the Engineer.

The documentation will be maintained throughout the construction period and the initial performance evaluation monitoring period. After the performance evaluation period is completed and all "fine-tuning" or modification of the remedial action has been carried out, the CQC Manager will transfer his file to the Engineer.

5.0 FIELD CHANGES AND CORRECTIVE ACTION

5.1 Field and Design Changes

Once under construction, site conditions are likely to be encountered that may require some alterations or adjustment of the design as presented in the plans and specifications. Such field changes, when necessary, shall be implemented according to the following criteria:

- Minor changes, such as adjusting the position of an item, will require the written approval of the Project Manager or Engineer.
- Changes in the basic design, such as an adjustment of the material specifications or size of a component, will require the approval of the Project Manager, the Engineer, and the Remedial Design Engineer.
- Major changes will require approval of the Project Manager, the Remedial Design Engineer, the Engineer, and the U.S. EPA and IDEM.

All changes will require approval of a Report of Field Change. Minor changes may be approved by the Engineer and shall be documented by a Report of Field Change.

Major design changes will be made only with written agreement of the Engineer and Remedial Design Engineer, and will be adjusted within the Technical Specifications.

5.2 Construction Problem and Corrective Actions Report

Reports describing special construction situations, as required by the Engineer, shall be prepared by the Remedial Contractor's Construction Manager and cross-referenced to specific observation logs and test data sheets. These reports shall include the following information:

- An identifying sheet number for cross-referencing and document control.
- A detailed description of the situation or deficiency.

- The location and probable cause of the situation or deficiency.
- How and when the situation or deficiency was found or located.
- Documentation of the corrective action taken to address the situation or deficiency.
- Final results of any responses.
- Any measures taken to prevent a similar situation from occurring in the future.
- The signature of the CQC Manager, Engineer, and the Project Manager indicating concurrence.

The Project Manager shall be made aware of any significant recurring non-conformance with the design specifications by the Engineer. The Project Manager shall then determine the cause of the non-conformance and recommend appropriate changes in procedures or specifications to the Engineer. These changes will be submitted to the appropriate Remedial Design Engineer, if necessary, for approval. When this type of evaluation is made, the results shall be documented, and any revision to procedure, or design specification, will be approved by the Remedial Design Engineer, if necessary, and the Engineer.

6.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

6.1 Construction Activity Reporting

The Engineer shall prepare periodic reports for the ECC Trust which summarize construction activities and the results of observations and tests. Progress reports shall be prepared at selected time intervals to document the status of the work. Certifications shall be prepared at the completion of major construction activities.

At the completion of the work, final documentation shall be prepared and shall include supporting field and laboratory test results.

6.1.1 Progress Reports

The Construction Manager shall prepare a progress report at time intervals established at the Pre-Construction Meeting and submit it to the Project Manager and the Engineer. As a minimum, this report shall include the following information:

- A unique identifying sheet number for cross-referencing and document control.
- The date, project name, location, and other information.
- A summary of work activities during progress reporting period.
- A summary of construction situations, deficiencies, and/or defects occurring during the progress reporting period.
- A summary of test results, failures and retests.
- The signature of the CQC Manager and Construction Manager.

The Project Manager shall distribute copies of the Progress Reports to the Engineer and Design Engineer.

6.1.2 Final Certification of Completion

At the completion of the work, the Remedial Contractor's CQC Manager shall submit to the ECC Trust and U.S. EPA and IDEM the signed Final Certification of Completion. At a minimum, the Final Certification of Completion shall include:

- Summaries of all construction activities
- Observation logs and test data sheets including sample location plans and supporting field and laboratory test results
- Construction problems and solutions reports
- Changes from design and material specifications
- Record plans
- A summary statement signed by the Construction Manager and the Project Manager that agrees with the conclusions of the Final Certification of Completion.

APPENDIX A

SAMPLING AND TESTING REQUIREMENT SUMMARY

APPENDIX A**MINIMUM TESTING FREQUENCY FOR SOIL MATERIALS
PAGE 1 OF 4**

Item	Test	Sample Frequency/Location
General Grading Fill (Suitable Material)	Standard proctor, ASTM D698 Nuclear densiometer, ASTM D2922 Moisture content, ASTM D3017 Moisture content, ASTM D2216 Sand cone, ASTM D1556	1 per 5,000 cubic yards or each change in soil type 5/acre/lift 5/acre/lift Minimum of 1 per 10 ASTM D3017 tests Minimum of 1 per 20 ASTM D2922 tests
Soil Cover (Select Material)	Standard proctor, ASTM D698 Sieve analysis, ASTM D422 Moisture content, ASTM D2216 Atterberg limits, ASTM D4318 Nuclear densiometer, ASTM D2922 Moisture content, ASTM D3017 Moisture content, ASTM D2216 Sand cone, ASTM D1556 Lift depth check Hydraulic conductivity ASTM D2434	1 per 5,000 cubic yards or each change in soil type 1 per 5,000 cubic yards or each change in soil type 1 per 5,000 cubic yards or each change in soil type 1 per 5,000 cubic yards or each change in soil type 5/acre/lift 5/acre/lift Minimum of 1 per 10 ASTM D3017 tests Minimum of 1 per 20 ASTM D2922 tests Placed material, 1 per 1/4 acre (or 100 foot centers) per 6 inch lift 1 per 5,000 cubic yards or each change in source
Fine Aggregate Subbase	Sieve analysis, ASTM D422 Lift depth check	1 per 5,000 cubic yards or each change in source 5/acre/lift Placed material 1 per 1/4 acre (or 100 foot centers)

APPENDIX A

MINIMUM TESTING FREQUENCY FOR SOIL MATERIALS PAGE 2 OF 4

Item	Test	Sample Frequency/Location
Select Material Backfill (Southern Concrete Pad)	Standard proctor, ASTM D698 Sieve analysis, ASTM D422 Moisture content, ASTM D2216 Atterberg limits, ASTM D4318 Nuclear densiometer, ASTM D2922 Moisture content, ASTM D3017 Moisture content, ASTM D2216 Sand cone, ASTM D1556 Lift Depth Check	1 per 5,000 cubic yards or each change in soil type 1 per 5,000 cubic yards or each change in soil type 1 per 2,000 cubic yards or each change in soil type 1 per 5,000 cubic yards or each change in soil type 5/acre/lift 5/acre/lift Minimum of 1 per 10 ASTM D3017 tests Minimum of 1 per 20 ASTM D2922 tests Placed material, 1 per 1/4 acre (or 100 foot centers) per 6 inch lift
Vegetative Layer	Soils classification ASTM D2487 Lift depth check	1 per 5,000 cubic yards or each change in material type Placed material, 1 per 1/4 acre (or 100 foot centers)
60 mil, HDPE liner	Conformance	
	Density, ASTM-D792A or ASTM-D1505	1 per 100,000 ft ²
	Carbon black content, ASTM-D1603	1 per 100,000 ft ²
	Carbon black dispersion, ASTM-D2669	1 per 100,000 ft ²
	Thickness, ASTM D-751	1 per 100,000 ft ²
	Tensile Characteristics, ASTM-D638	1 per 100,000 ft ²

APPENDIX A

**MINIMUM TESTING FREQUENCY FOR SOIL MATERIALS
PAGE 3 OF 4**

Item	Test	Sample Frequency/Location
60 mil, HDPE liner (continued)	Melt flow index, ASTM-D1238	1 per 100,000 ft ²
	Installation-Seams	
	Destructive, peel and shear, ASTM D4437 Sheet ASTM D638	Random locations, 1 per 4 hours of seaming, or minimum of 1 per day per seamer
	Nondestructive testing, vacuum ASTM S4437-84 or air pressure for fusion	All seams
Geotextile	Conformance	
	Mass per unit area - ASTM D3776	1 per 100,000 ft ²
	Burst strength ASTM D3786	1 per 100,000 ft ²
	Permittivity - ASTM D4491	1 per 100,000 ft ²
	Apparent opening size - ASTM D4751	1 per 100,000 ft ²
	Grab strength - ASTM D4632	1 per 100,000 ft ²
	Trapezoidal tear - ASTM D4533	1 per 100,000 ft ²
	Puncture strength - ASTM D4833	1 per 100,000 ft ²
	Thickness - ASTM D1777	1 per 100,000 ft ²

APPENDIX A**MINIMUM TESTING FREQUENCY FOR SOIL MATERIALS****PAGE 4 OF 4**

Item	Test	Sample Frequency/Location
	Construction	
	Overlap 12 inch minimum	All seams
	Sewn - 4 inch minimum	All seams
Geocomposite	Mass per unit area - ASTM 3776	1 per 100,000 ft ²
Erosion Control Revetments	Mass per unit area - ASTM D-3766 Trapezoidal Tear - ASTM D4533 Density - ASTM D792 Fiber Tensile Strength - ASTM 2101 Chemical Resistance - ASTM D543 Strip Tensile Test - ASTM D1682 Thickness - ASTM D1777 Falling Head Permittivity - ASTM D4491 Seam Strength - ASTM D751 Wuzenbeek Abrasion Resistance - ASTM D4157 Grab Strength - ASTM D4632 UV Light Resistance - ASTM D4355 Mullen Burst Test - ASTM D3786 Puncture Test - ASTM D3787	1 per project

APPENDIX B
CQC REPORT FORMS

**ECC SITE
ZIONSVILLE, INDIANA
PROJECT NUMBER _____**

TRANSMITTAL

To: _____ Project: _____

Date: _____ Our Job No.: _____

We are enclosing _____ copies of the following:

- | | |
|--|---|
| <input type="checkbox"/> Subcontract Agreement | <input type="checkbox"/> Photograph Data Sheet |
| <input type="checkbox"/> Shop Drawings | <input type="checkbox"/> Report of Field Change |
| <input type="checkbox"/> List of Materials | <input type="checkbox"/> Daily QC Report |
| <input type="checkbox"/> Plans | <input type="checkbox"/> Non-Compliance Notice |
| <input type="checkbox"/> Specifications | <input type="checkbox"/> Final Certification |
| <input type="checkbox"/> Submittals List | <input type="checkbox"/> For Your Use |
| <input type="checkbox"/> Daily Report | <input type="checkbox"/> For Review and Comment |
| <input type="checkbox"/> Progress Report | <input type="checkbox"/> For Approval |
| <input type="checkbox"/> _____ | |

Remarks: _____

Copies to: _____	By: _____
_____	_____
_____	_____

CONSTRUCTION MANAGER'S DAILY REPORT

ECC SITE
ZIONSVILLE, INDIANA

PROJECT NUMBER _____
REPORT NUMBER _____

Date: _____

Day

S	M	T	W	TH	F	S
---	---	---	---	----	---	---

WEATHER

TEMP.

WIND

HUMIDITY

Brite Sun	Clear	Overcast	Rain	Snow
To 32	32-50	50-70	70-85	85 up
Still	Moder	High	Report No	
Dry	Moder	Humid		

Average Field Force			
Name of Contractor	Non-manual	Manual	Remarks

Visitors			
Time	Representing	Representing	Remarks

Equipment at the Site: _____

Construction Activities: _____

By: _____

Title: _____

Distribution:

1. Project Manager
2. CQC Manager
3. Engineer
4. Site File

**CONSTRUCTION MANAGER'S
MONTHLY PROGRESS REPORT**

**ECC SITE
ZIONSVILLE, INDIANA
PROJECT NUMBER _____**

Work Accomplished by Contractor: _____

Work Anticipated for Next Month: _____

Problems: _____

By: _____

Title: _____

Distribution:

1. Project Manager
2. CQC Manager
3. Engineer
4. Site File

CONSTRUCTION MANAGER'S MONTHLY PROGRESS REPORT (Continuation Sheet)

Work Accomplished by Contractor (Continued)This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

By: _____

Title: _____

Distribution:

1. Project Manager
2. CQC Manager
3. Engineer
4. Site File

Page ____ of ____ Pages

**ECC SITE
ZIONSVILLE, INDIANA
PROJECT NUMBER _____**

PHOTOGRAPHIC REPORTING DATA SHEET

Date: _____

Time Period Photographs Were Taken: _____

Roll Number: _____ Frame Number: _____

General Description of Photographs: _____

Any Specific Items for the Record: _____

By: _____ Title: _____

Distribution:

1. Project Manager
2. CQC Manager
3. Construction Manager

**ECC SITE
ZIONSVILLE, INDIANA
PROJECT NUMBER _____**

REPORT OF FIELD CHANGE

Date: _____

REFERENCE DATA

Specification Section No.: _____ Page No.: _____ Paragraph No.: _____

Drawing No.: _____ Entitled: _____

Sketch No.: _____ Dated: _____ Entitled: _____

DESCRIPTION

1. Detailed Identification of the Problem: _____

2. Detailed Solution Proposed or Accomplished: _____

3. Is the Problem an Isolated Case or General? _____

4. Submit Sketches as Necessary

By: _____ Title: _____

Approved By: _____

Distribution: 1. Project Manager
 2. CQC Manager
 3. Remedial Design Engineer's Project Manager

DAILY QUALITY CONTROL REPORT
PAGE 1 OF 2

ECC SITE
ZIONSVILLE, INDIANA
PROJECT NUMBER _____

DAILY QUALITY CONTROL REPORT

Date: _____

Weather: _____

Work Performed: _____

DAILY QUALITY CONTROL REPORT
PAGE 2 OF 2

Date: _____

Material/Equipment Delivered (Identify Supplier and Quantity):

Results of Inspections (See Attached Inspection Report): _____

Results of Testing (See Attached Testing Report): _____

Verbal Instructions and/or Comments: _____

Remarks (Including Deficiencies/Corrective Actions): _____

CERTIFICATION: I certify that the above report is complete and correct and that I, or my authorized representative, have inspected all work performed this day by the prime contractor and each subcontractor and have determined that all materials, equipment, and workmanship are in strict compliance with the plans and specifications except as may be noted above.

Signature

Date

Distribution: 1. Project Manager
2. Construction Manager

NON-COMPLIANCE NOTICE
PAGE 1 OF 1

ECC SITE
ZIONSVILLE, INDIANA
PROJECT NUMBER _____

To: _____

Date: _____ Time (AM/PM): _____ Inspector: _____

Contractor: _____ Contract No.: _____

You are hereby notified that ☐ tests ☐ inspection indicates that the _____

_____ does not conform to the Specifications requirements. The specification violated is

Section _____ Article/Paragraph _____. Under the provisions of the Contract

Specifications, the requirements are _____

Noncomplying work may be required to be removed and replaced at no cost to the ECC Trust.

It shall be your responsibility to determine the corrective action necessary, and to determine whether you wish to discontinue operations until additional investigations by the ECC Trust or Engineer confirm or refute the initial findings.

Construction QC Manager

Noncompliance notice was received by the Contraction Manager on _____ (date).

By: _____ Title: _____

Distribution: 1. Construction Manager
 2. Project Manager
 3. Site File

**FINAL CERTIFICATION
OF COMPLETION**

**ECC SITE
ZIONSVILLE, INDIANA
PROJECT NUMBER _____**

To: ECC Trust Date: _____

Attn: ETC Engineer

From: _____

This is to certify that I, _____ am an authorized
official of _____
working in the capacity of _____

and have been properly authorized by said firm or corporation to sign the following statements
pertaining to the subject contract:

I know of my own personal knowledge, and do hereby certify, that
the work of the Contract described above has been performed, and
materials used and installed in every particular, in accordance
with, and in conformity to, the Contract Drawings and
Specifications.

The Contract work is now complete in all parts and requirements,
and ready for your final inspection.

By: _____

Title: _____

For: _____

Distribution: 1. Project Manager